UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WILDLIFE SERVICES

APHIS
Animal and Plant Health Inspection Service

SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT

ORAL VACCINATION TO CONTROL SPECIFIC RABIES VIRUS VARIANTS IN RACCOONS, GRAY FOXES, AND COYOTES IN THE UNITED STATES

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EXECUTIVE SUMMARY

This supplemental Environmental Assessment (EA) documents the analysis of the potential environmental effects of a proposal to continue and expand the involvement of the U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service, Wildlife Services (APHIS-WS) program in oral rabies vaccination (ORV) programs in 26 states and the District of Columbia. The states where APHIS-WS involvement would be continued or expanded include: Alabama, Connecticut, Delaware, Florida, Georgia, Indiana, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Mississippi, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Vermont, Virginia, and West Virginia. The programs' primary goals are to stop the spread of specific raccoon (eastern states), gray fox (Texas) and coyote (Texas) rabies variants or "strains" of the rabies virus. If not stopped, these strains could potentially spread to much broader areas of the U.S. and Canada and cause substantial increases in public and domestic animal health costs because of increased rabies exposures.

The oral rabies vaccine used in these programs is the recombinant vaccinia-rabies glycoprotein (RABORAL V-RG® MERIAL, Inc.) vaccine currently licensed for use in raccoons and coyotes in the U.S. and Canada (although it is only being used for raccoons in Canada, as canine rabies does not occur in coyotes in Canada) and approved for experimental use in gray fox in Texas. It has been used extensively and successfully in Europe to combat fox rabies. This vaccine is contained in baits which are distributed by aircraft and by ground placement and then are picked up and consumed by the target species. It has been found to be safe for use in a number of animal species.

The proposed action would involve use of federal funds by APHIS-WS to purchase ORV baits and cooperate with programs in the aforementioned states in the distribution of such baits to create zones of vaccinated target species that then serve as barriers to further advancement of the particular rabies virus variants. ORV baits could also be used in other areas where the particular rabies virus variants are known to occur with the goal of eliminating those variants from such areas. The proposed action would also include APHIS-WS assistance in monitoring and surveillance activities involving the capture and release or lethal collection of the targeted animal species in the aforementioned states to take biological samples for testing to determine the effectiveness of the ORV programs. APHIS-WS could also assist the states in implementing contingency plans that include the localized population reduction of the target species in areas where rabies outbreaks occur beyond ORV barriers.

This supplemental EA analyzes a number of environmental issues or concerns with the oral rabies vaccine and with activities associated with ORV programs such as capturing and handling of animals for monitoring and surveillance purposes, as well as the potential implementation of contingency actions to address rabies outbreaks such as more concentrated localized ORV use or localized suppression of target species populations. The EA also analyzes several alternatives to the proposed action, including no action (i.e., no federal funding or participation by APHIS-WS), live-capture-vaccinate-release programs (i.e., trapping animals followed by administration of injectable vaccines and then release), and ORV bait distribution without animal specimen collections or localized lethal removal of target species under state contingency plans (i.e., no capturing or lethal removal of animals by APHIS-WS for monitoring or surveillance purposes or to address localized rabies outbreaks).

No cumulative impacts are anticipated from the distribution of ORV into the environment. The ORV vaccine and bait that would be used has been found safe to use on target and other animal species, has a negligible risk of causing adverse affects to humans, is readily consumed by target animal species, and does not cause bioaccumulation in the environment. A limited number of baits would be distributed one time per year, thereby limiting the potential for persons to be exposed to ORV baits or bait distributing equipment. Therefore, the analysis in this supplemental EA indicates no significant impacts on the quality of the human environment are expected from APHIS-WS continued or expanded involvement in these programs.

1.0 CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

1.1 BACKGROUND

Rabies is an acute, fatal viral disease of mammals most often transmitted through the bite of a rabid animal. The disease can be effectively prevented in humans and many domestic animal species, but abundant and widely distributed reservoirs among wild mammals complicate rabies control. Within most of the U.S., these reservoirs occur in geographically discrete regions where the virus transmission is primarily between members of the same species (Krebs et al. 2000). These species include but are not limited to raccoons (*Procyon lotor*), coyotes (*Canis latrans*), skunks (primarily *Mephitis mephitis*), gray foxes (*Urocyon cinereoargenteus*), and red foxes (*Vulpes vulpes*). Species specific variants of the virus may be transmitted to other animal species. However these encounters rarely result in sustained virus transmission within that animal species. Once established, virus transmission within a specific animal species can persist at epidemic levels for decades, even perhaps for centuries (Krebs et al. 2000).

The vast majority of rabies cases reported to the Centers for Disease Control and Prevention (CDC) each year occur in raccoons, skunks, and bats (Order *Chiroptera*). Red foxes account for less than 10 percent of the reported rabies cases, with domestic cats, dogs and cattle among those most often reported (CDC 2001a). Two canine rabies epizootics (epidemics in animals) emerged in Texas in 1988, one involving coyotes and dogs in South Texas and the other in gray foxes in West/Central Texas. The South Texas epizootic alone has resulted in two human deaths and caused over 3,000 people to receive postexposure rabies treatment (TDH 2004).

1.1.1 Public Health Importance of Rabies.

Over the last 100 years, rabies in the United States has changed dramatically. About 90 percent or greater of all animal cases reported annually to CDC now occur in wildlife (Krebs et al. 2000, CDC 2001a). Before 1960 the majority of cases were reported in domestic animals. The principal rabies hosts today are wild carnivores and bats. The number of rabies-related human deaths in the U.S. has declined from more than 100 annually at the turn of the century to an average of one or two people/year in the 1990s. Modern day prophylaxis, which is the series of vaccine injections given to people who have been potentially or actually exposed, has proven nearly 100 percent successful in preventing mortality when administered promptly (CDC 2001a). In the U.S., human fatalities associated with rabies occur in people who fail to seek timely medical assistance, usually because they were unaware of their exposure to rabies.

Although human rabies deaths are rare, the estimated public health costs associated with disease detection, prevention, and control have risen, and are estimated to exceed $300 to $450 million annually. These costs include the vaccination of companion animals, maintenance of rabies laboratories, medical costs, such as those incurred for exposure case investigations, rabies post-exposure prophylaxis (PEP) and animal control programs (CDC 2001a).

Accurate estimates of these expenditures are not available. Although the number of PEPs given in the U.S. each year is unknown, it is estimated to be about 40,000. When rabies becomes epizootic or enzootic (i.e., present in an area over time but with a low case frequency) in a region, the number of PEPs in that area increases. Although the cost varies, a course of rabies immune globulin and five doses of vaccine given over a four-week period typically exceeds $1,000 (CDC 2001a) and has been reported to be as high as $3,000 or more (Meltzer 1996). In Massachusetts during 1991-95, the median cost for PEP was $2,376 per person (CDC 2001b). Also, as epizootics spread in wildlife populations, the risk of "mass" human exposures requiring treatment of large numbers of people that contact individual rabid domestic animals infected by wild rabid animals increases – one case in Massachusetts involving contact with, or drinking milk from, a single rabid cow required PEPs for a total of 71 persons (CDC 2001b). The total cost of this single incident exceeded $160,000 based on the median cost for PEPs in that state cited above. Perhaps the most expensive single mass exposure case on record in the U.S. occurred in 1994 when a kitten from a pet store in Concord, NH tested positive for rabies after a brief illness. As a result of potential exposure to this kitten or to other potentially rabid animals in the store, at least 665 persons received postexposure rabies vaccinations at a total cost of more than $1.1 million (Noah et al. 1995).

1.1.2 Raccoon Rabies in the Eastern U.S.

Based on surveillance data, raccoon rabies did not exist outside a focus in Florida before the 1940s and is, therefore, considered an exotic strain in the U.S. outside this area (C. Rupprecht, CDC, pers. comm. 2003). After raccoon rabies was described in Florida, it spread slowly during the next three decades into Georgia, Alabama, and South Carolina. It was unintentionally introduced into the mid-Atlantic states, probably by translocation of infected animals (Krebs et al. 1999). The first cases appeared in West Virginia and Virginia in 1977 and 1978. Since then, raccoon rabies in the area expanded to form the most intensive rabies outbreak in the U.S. The strain is now enzootic in all of the eastern coastal states, as well as Alabama, Pennsylvania, Vermont, West Virginia, and, most recently, parts of Ohio (Krebs et al. 2000). In the past 21 years, all of the mid-Atlantic and New England states have experienced at least one outbreak. The raccoon rabies epizootic front reached Maine in 1994, reflecting a movement rate of about 30 miles per year (48.3 km/yr). It was also first confirmed in northeastern Ohio in 1996 (Krebs et al. 1998). In 1999, the first three cases of raccoon rabies were confirmed in southern Ontario (Rosatte et al. 2001) and the strain has recently been reported in New Brunswick.

Raccoon rabies presents a human health threat through potential direct exposure to rabid raccoons, or indirectly through the exposure of a pet that had an encounter with a rabid raccoon. To date, one case resulting in the death of a human is attributable to the raccoon strain of the rabies virus. A 25-year-old, previously healthy northern Virginia man died in June 2003. A diagnosis of rabies had not been considered and was only made 3 months after death when brain tissue was examined. Patient history did not reveal contact with animals and no specific exposure experience could be determined (S. Jenkins, Virginia Department of Health, pers. comm. 2003, L. Orciari, CDC, pers. comm. 2003). Adding to the threat of the raccoon strain of the rabies virus are the number of pets and livestock examined and vaccinated for rabies, the number of diagnostic tests requested, and the number of post exposure treatments are all greater when raccoon rabies is present in an area. Human and financial resources allocated to rabies-related human and animal health needs also increase, often at the expense of other important activities and services.

The westward movement of the raccoon rabies front has slowed, probably in response to both natural geographic and man-made barriers. The Appalachian Mountains and perhaps river systems flowing eastward have helped confine the raccoon variant to the eastern U.S. In northeast Ohio, an oral rabies vaccination (ORV) program has established an "immune barrier" along its border with Pennsylvania from Lake Erie to the Ohio River near East Liverpool, Ohio that has slowed the westward expansion of raccoon rabies. If raccoon rabies breaches this barrier, current live trapping results in Ohio (A. Montoney, APHIS-WS, pers. comm. cited in Kemere et al. 2001) as well as the status of raccoons in the Midwest (Sanderson and Hubert 1982, Glueck et al. 1988, Hasbrouck et al. 1992, Mosillo et al. 1999) suggest that raccoon populations are sufficient for rabies to spread westward along a front at a rate similar to or greater (Rupprecht and Smith 1994) than the rate at which this rabies strain has spread in the eastern U.S. Figure 1-1 shows the potential for spread of this rabies variant across the central portion of the U.S. if it is not stopped.

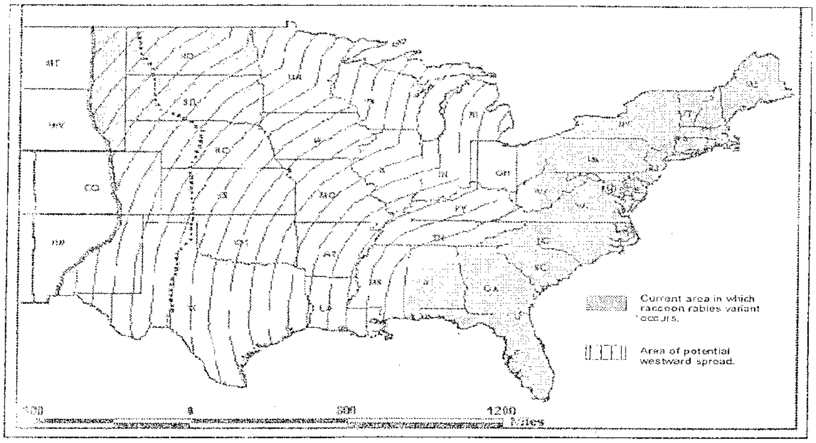


Figure 1-1. Potential areas of the U.S. into which raccoon rabies could spread if not stopped by rabies management programs (from Kemere et al. 2001).

1.1.3 Gray Fox and Coyote Rabies in Texas.

In 1988, a strain of rabies that had previously been confined to urban domestic dogs became established in coyotes (*Canis latrans*) along the U.S.-Mexico border in south Texas (Clark and Wilson 1995). This canine strain of rabies is readily transmitted from coyotes to domestic dogs and, subsequently, between domestic dogs (Clark et al. 1994). Rabies outbreaks involving domestic animals greatly increase the risk of human exposure which heightened the seriousness of this particular epizootic from a public health standpoint (Clark and Wilson 1995). By 1994, this strain had advanced 158 miles (255 km) north of the U.S.-Mexico border. Two human deaths from this strain occurred during this time - one in 1991 and another in 1994 (Clark and Wilson 1995).

Prior to 1988, a gray fox (*Urocyon cinereoargenteus*) strain of rabies was enzootic (prevalent) in West Texas. From a starting point near Sonora, Texas in Sutton County in 1988, an epizootic of gray fox rabies cases expanded 80.8 miles (130 km) northward and 158.45 miles (255 km) eastward. This particular strain was readily transmitted to raccoons and to livestock, especially cows and goats (Clark and Wilson 1995).

The south Texas canine rabies epizootic alone has resulted in over 3,000 people receiving postexposure rabies treatment (TDH 2004). In 1994, the public health threat created by these two expanding epizootics prompted the Governor of Texas to declare rabies a public health emergency in the state (Clark and Wilson 1995).

1.1.4 Primary Need for Action.

If new rabies strains such as those transmitted by raccoons, gray foxes, and coyotes are not prevented from spreading to new areas of the U.S., the health threats and costs associated with rabies are expected to increase substantially as broader geographic areas of the U.S. are affected. In the area that stretches west from the leading edge of the current distribution of raccoon rabies (which stretches from Alabama northeast along the Appalachian Mountains through coastal Maine) to the Rocky Mountains, and north from the distribution of gray fox and coyote rabies in Texas, there are more than 111 million livestock animals, including cattle, horses, mules, swine, goats, and sheep, which are valued at $42 billion (65 FR 76606-76607, December 7, 2000). If raccoon, gray fox, or coyote rabies were to spread into the above described area, many of these livestock would be at risk to these specific rabies variants. More importantly, human health care concerns would be expected to increase substantially as well if raccoon, coyote and gray fox strains of rabies infect a much broader geographic area which would add to the current high costs of living with these strains.

1.1.5 Development of Oral Rabies Vaccine Programs.

Although the concept of ORV to control rabies in free-ranging wildlife populations originated in the U.S. (Baer 1988), it has a longer history of implementation in Europe and Canada. The emergence of raccoon rabies in the U.S. during the 1970s heightened interest in the application of ORV to raccoons. Due to biological and ecological differences among the types of animals that transmit rabies, development of specific vaccine and bait combinations was needed. One of the main difficulties was the development of a safe and effective vaccine for raccoons. In contrast to red foxes, which were the primary subjects of ORV programs in Europe and Canada, raccoons were not readily immunized by the oral route with the modified live rabies virus vaccines that worked well in foxes (Rupprecht et al. 1988). In addition, modified "live virus" vaccines pose a small risk of causing vaccine-induced rabies, and have resulted in some cases of vaccine-induced rabies in animals (but no cases in humans) during oral baiting programs in Europe and Canada (Wandeler 1991). However, vaccinia-rabies glycoprotein (V-RG) vaccine has proven to be orally effective in raccoons, coyotes and foxes. This vaccine was extensively evaluated in the laboratory for safety in more than 50 vertebrate species with no adverse effects regardless of route or dose. As a consequence of field safety testing in the early 1990s, V-RG was conditionally licensed in 1995 and fully licensed in 1997 in the U.S. for vaccination of free-ranging raccoons. It remains the only effective vaccine licensed for use in the U.S. and Canada for raccoons. V-RG was also recently fully licensed by the USDA in 2002 for vaccination of coyotes in the U.S. and Canada. It has been approved for experimental use to vaccinate wild gray foxes in Texas.

The vaccinia-rabies glycoprotein vaccine is commercially available from MERIAL, 115 Transtech Drive, Athens, GA 30601 under the registered name RABORAL V-RG®. It is currently the only licensed oral vaccine available for rabies control in some wild carnivores in the U.S. (CDC 2000). Throughout the remainder of this document, RABORAL V-RG® is referred to as "V-RG". As a recombinant vaccine, the letter "V" is used to denote vaccinia, the self-replicating pox virus that serves as the vector (i.e., carrier) for the rabies virus gene that is responsible for the production of rabies glycoprotein. The letters "RG" stand for rabies glycoprotein which is the protective sheath around the bullet-shaped rabies virus core. The glycoprotein by itself is noninfective and cannot cause rabies, but it serves as an "antigen" which means it elicits an immune response to rabies when the vaccine is swallowed by raccoons, foxes, or coyotes. There is no possibility of vaccine-induced rabies with V-RG because the vaccine only contains the non-infective surface protein of the rabies virus; none of the viral nuclear material (i.e., RNA) which would be required for the rabies virus to replicate is present in the vaccine. Approximately 48.75 million doses[1] have been distributed in the U.S. since 1995 with only one case of vaccinia virus infection reported in humans (resulting in localized skin rashes) to date (Rupprecht et al. *unpublished* 2000, Rupprecht et al. 2001). This vaccine has been tested in more than 50 wild mammalian and avian species without adverse effects. In addition, a domestic animal's annual rabies vaccination can be safely administered even if it recently ingested a dose of oral rabies vaccine.

A number of studies have been conducted to determine the best bait formulations and strategies for delivery of ORV vaccines to raccoons (Hanlon et al. 1989a, Hable et al. 1992, Hadidian et al. 1989, Linhart et al. 1991, Linhart et al. 1994), gray fox (Steelman et al. 1998, 2000), and coyotes (Linhart et al. 1997; Farry et al. 1998a, 1998b). When raccoons, foxes or coyotes eat oral rabies baits and puncture a sachet[2] containing the vaccine, the vaccine is swallowed and bathes the lymphatic tissue in the throat area and initiates the immunization process. A positive rabies

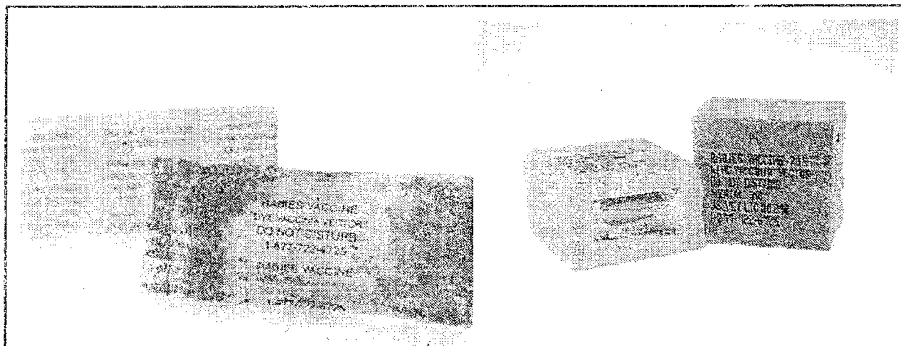
[1] Numbers of baits disbursed over time refers only to APHIS-WS involvement. State and local health departments and other programs have also distributed baits without APHIS-WS involvement.

[2] A thin plastic packet much like those in which condiments (e.g., catsup, mustard) are provided at fast food restaurants.

antibody titer in an animal from a baited area is most likely due to consumption of a bait and adequate contact with vaccine. However, the lack of a detectable antibody response may not be an accurate reflection of immune status. It is possible that the animal was successfully immunized, but that the blood sample was taken earlier or later than when antibodies could be detected (C. Hanlon, CDC, pers. comm. 2003). Antibodies induced by a one-time oral vaccination appear to be of relatively short duration. Among a group of animals in a baited area, the best time to collect blood samples for detection of antibodies is 3-8 weeks after baiting. A successfully immunized animal may have antibodies shortly after vaccination, but then the level may decline to undetectable levels. If the animal is then exposed to rabies, it is still likely that the animal's "memory" immunity will become activated by the rabies exposure and more antibodies will be made very quickly. The successfully immunized animal will most likely survive exposure, even though it did not have measurable antibodies at the time of the exposure (C. Hanlon, CDC, pers. comm. 2003).

The baits are small blocks of fishmeal (for coyotes and raccoons) or dog food (for gray foxes) that are held together with a polymer binding agent and are considered to be "food grade" materials (Figure 1-2). The dog food baits are now prepared from poultry-based dog food as concerns were raised regarding the possibility of beef-based dog food containing bovine spongiform encephalopathy (BSE, also known as mad cow disease). To address these concerns, the change to poultry-based products was made on a voluntary basis by MERIAL, Inc. (J. Maki, MERIAL, Inc., pers. comm. 2003). The baits are rectangular or square in shape with hollow centers. The sachet containing the liquid vaccine is contained in the hollow center of the bait. "Coated" sachets (Figure 1-2) with a simple fishmeal attractant coating have also been field tested with effectiveness that appears to be comparable to fishmeal polymer baits containing the sachet (Linhart et al. *unpublished* 2001). Using the "coated" sachet may be equal in effectiveness at lower cost per vaccinated target wild animal. All baits are marked with a warning label that includes a phone number to call for additional information.

Cornell University recently conducted a study (USDA 2004a) comparing the performance of the coated sachet to fishmeal polymer baits for delivering oral rabies vaccine in the wild. Results from this study, along with those from captive studies being conducted by the APHIS-WS, National Wildlife Research Center, are critical to decisions regarding the best available bait for delivering oral rabies vaccine to raccoons. Preliminary results, yet to be published by Cornell, suggest that the coated sachet performs at least as good as fishmeal polymer bait and often exceeds its performance. Generally higher performance at a lower cost (approximately 20 percent less than fishmeal polymer baits), plus the lower risk of damage from aerial bait distribution, make the coated sachet a good interim bait option while other baits are evaluated for safety and efficacy.



Coated Sachet — Fishmeal Polymer

Figure 1-2. Coated Sachet and Fishmeal Polymer baits utilized during the ORV program. (Photos used with permission from MERIAL Limited, Athens, Georgia, USA).

The ORV baits may contain a tetracycline biomarker. These biomarkers bind to calcium, which can be found in the metabolically active portions of bones and teeth of animals. Tetracycline deposits can be viewed in the teeth or bones with fluorescent light under a microscope. When the tooth or bone sample of an animal is positive for tetracycline, it is likely that the animal has eaten at least one bait and possibly multiple baits (C. Hanlon, CDC, pers. comm. 2003). Other potential sources of "background" tetracycline in a study area may include consumption of medicated feeds such as those sometimes used for production animals, intentional treatment by humans with tetracycline, and non-specific fluorescence from undescribed but similar chemical compounds that may be found naturally (C. Hanlon, CDC, pers. comm. 2003). The presence of tetracycline, however, is not an indication of immunity since it is possible in some situations for an animal to eat the outer bait matrix without rupturing the vaccine sachet inside.

In field tests conducted in the U.S., the majority of ORV baits have been consumed within the first 7 to 14 days after placement, with reports of up to 100 percent of the baits being consumed within a 7 day period (Farry et al. 1998b, Hable et al. 1992, Hadidian et al. 1989, Hanlon et al. 1989a, Linhart et al. 1994, Steelman et al. 2000, USDA 1995a). The likelihood of a bait being consumed is dependent upon several factors including animal population densities (target and non-target species), bait preference, and the availability of alternative food sources. Those baits that are not consumed may remain in the environment for several months after placement, dependent upon environmental conditions (precipitation, temperature, etc.) and the condition of the baits. The V-RG virus that is not consumed by the target species or other vertebrates will become inactivated over a relatively short time period. Persistence and stability of the V-RG virus outside of an organism is highly dependent on ambient temperature and local environmental conditions, the higher the temperature the quicker the virus will become inactive (USDA 1992, USDA 1995a). For example, at temperatures between 68 and 100 degrees Fahrenheit (20 and 37.8 Celsius) the liquid viral vaccine potency remains stable for approximately 14 to 7 days, respectively, in the un-punctured sachet or inside the bait. In situations where the bait and sachet are damaged inactivation of the V-RG virus will occur more rapidly.

Oral wildlife vaccination for raccoon rabies control has been under field evaluation in the U.S. since 1990. A limited field release of the recombinant vaccine occurred on Parramore Island, VA, prior to wider spread use in the U.S. for control of raccoon rabies (Hanlon et al. 1998). A major objective of this field trial was to evaluate the free-ranging raccoon population for adverse effects after the distribution of V-RG vaccine-laden baits. With the development and field testing of the V-RG vaccine, a potential method of rabies control now exists for some rabies variants to complement methods of control which include public education, domestic animal vaccination, and human PEP. In 2004, APHIS-WS, in cooperation with the CDC, will begin conducting small mammal vaccinia monitoring at Parramore Island, VA. Because this is the site where vaccinia was first released into the wild in ORV baits and since these baits have not been released at this site since the early 1990s, viruses in hosts can be monitored. Microtine mammals, especially rodents, are typically the most likely hosts for orthopox viruses, which include vaccinia. Thus, these mammals are good sentinel species for indicators for the environmental presence of viruses, such as vaccinia. Samples will be collected and tested at CDC laboratories to determine the presence of vaccinia virus in small mammals collected at this site. Current plans involve conducting similar sampling and testing of small mammals at Plum Brook, OH in the near future for vaccinia surveillance.

Since the first field release of the V-RG vaccine in 1990, the number of vaccine-laden baits that were distributed annually in the U.S. has risen exponentially. For instance, APHIS-WS' involvement in the national rabies management program between 1995 and 2003 contributed to 43.75 million ORV baits disbursed in the U.S (USDA 2004c). Numerous projects have been conducted or are in progress in the eastern U.S. and Texas (USDA 2004a, 2004c). Since ORV program inception, positive rabies cases have either decreased or the advance of the virus has been slowed or stopped in each state where an ORV program was initiated:

- In Maryland, 18 rabies cases were reported per year on the Annapolis Peninsula alone before the ORV program began in 1998. From 2000-2002 and 2003, Maryland reported zero cases and one case, respectively (USDA 2004a, 2004c).

- In New York, an ORV program was implemented in 1998 to prevent the northward spread of the virus. Prior to the ORV program in New York, almost 150 positive rabies cases were recorded in 1998 and 1999. In 2002, New York reported a decline to 4 positive rabies cases, of which only one was attributed to a raccoon, and zero cases have been reported since (USDA 2004a, 2004c). A recently completed project in Albany and Rensselaer Counties of New York State demonstrated that raccoon rabies may be virtually eliminated from an area where the disease had been present for a number of years by use of ORV.

- In Vermont, before the program was started in 1996, positive rabies cases were found 73 km. (45.5 miles) south of the Quebec, Canada border. With an annual rate of spread of rabies at 56.3 km/year (35 miles/year), positive raccoon strain rabies cases should have reached the Canada border as early as 1999. However, the border has not yet been breached (USDA 2004a, 2004c). Annual vaccination projects in the Lake Champlain Valley in Vermont and New York have shown promise in preventing the northward spread of raccoon rabies. Raccoon rabie has moved through much of the St. Lawrence River Valley in northern New York with the appearance of two raccoon rabies foci (i.e., point locations of rabies cases) in southern Ontario. Cooperative efforts with Ontario and the implementation of point infection control strategies in Ontario around these foci are under evaluation to determine if the raccoon variant of the rabies virus can be contained and eliminated (L. Bigler, pers. comm. 2001).

- In Ohio, 62 positive rabies cases were recorded prior to program implementation in 1997. From 2001-2003, three cases were reported near the Pennsylvania border where raccoon rabies is still enzootic. In 2001, APHIS-WS, in coordination with state agencies, began an ORV program in Pennsylvania (USDA 2004a, 2004c) to address this issue. The ability to create rabies-free zones, within raccoon rabies enzootic areas, is a requisite to achieve elimination of this variant of the rabies virus.

  In mid-July 2004, a raccoon infected with raccoon variant of the rabies virus was confirmed just west of the ORV zone near Lake Erie in Lake County in northeastern Ohio. This cooperative ORV project began in 1997 and has expanded to include the states of Pennsylvania, West Virginia, Virginia, Tennessee, Maryland, Georgia and Alabama. Throughout its length from Ohio to northeastern Alabama, the ORV zone is at least 30-miles in width to attempt to prevent the westward spread of raccoon rabies. APHIS-WS and state, county and municipal cooperators responded immediately to this high priority rabies issue. A contingency action plan that included enhanced rabies surveillance, trap-vaccinate-release, and ORV was implemented upon detection of the index case. High raccoon population densities and additional rabies cases based on enhanced surveillance suggest that additional action may be required. Enhanced rabies surveillance is being maintained on the south and west sides of this outbreak to determine the next course of action, if required.

- In Massachusetts, the rabies virus had not spread to the Cape where intensive baiting programs at the peninsular neck (since 1995), combined with the natural barrier of Cape Cod Canal, seemed to act as effective barriers (Robbins et al. 1998). In early March 2004; however, raccoon variant of the rabies virus was confirmed east of the Cape Cod Canal for the first time. The canal served as the eastern anchor point for the ORV zone which was designed to prevent raccoon rabies from spreading east onto the Cape. This cooperative project was initiated in the mid-1990s by Tufts University and the State of Massachusetts Health Department. APHIS-WS became a partner in this effort in 2001. APHIS-WS, Tufts University, and the State of Massachusetts Health Department immediately implemented enhanced rabies surveillance, followed by trap-vaccinate-release and ORV as a contingency action plan to prevent further spread, with the long range goal of eliminating raccoon rabies from the area. It is not known if raccoon rabies spread to the Cape through the long range movement of an individual rabid raccoon or skunk infected with raccoon variant of the rabies virus or if the virus spread animal to animal approaching the canal, with rabies spreading to the Cape through a short range raccoon or skunk movement across the canal. Translocation, either intentional or unintentional (i.e., raccoon "hitch-hiking" in a garbage truck or tailored boat and escaping once on the Cape), represents another other potential source of spread.

- In June 2003, the rabies front, which had stalled in North Carolina, finally moved west and crossed over the Appalachians into upper east Tennessee (6 raccoon strain cases were reported). In attempt to stay ahead of the rabies front, APHIS-WS extended the ORV baiting area into Tennessee (USDA 2004a, 2004c).

- Since 1995, 9.35 million vaccine-laden baits have been distributed in south Texas in an ORV program that has proved to be highly effective in the elimination of the canine rabies strain in that area. Prior to the ORV program, 166 canine strain rabies cases were reported in Texas. One case was reported in 2001 along the Texas-Mexico border and zero cases have been reported since. Similar success is sought in the gray fox epizootic in west-central Texas where 10.6 million vaccine-laden baits have been distributed. In 2002, 18 positive cases of gray fox strain rabies occurred outside the barrier, possibly due to an interrupted baiting program in 2000 and 2001 as a result of a lack of funding. Increased funding was provided for the 2003 gray fox ORV program in Texas in order to encircle the zone where positive cases have been reported and blanket the area (USDA 2004a, 2004c).

- Projects have also been conducted or are in progress in New Jersey (1992-1994, with additional projects reinitiated in the last couple of years), Florida (1995-present), Virginia (2000-present), West Virginia (2001-present), Pennsylvania (1995-present), NH (2002-present), AL (2003-present), GA (2003-present), and ME (2003-present).

1.2 DESCRIPTION OF THE PROPOSED ACTION

In accordance with the provisions of the Act of September 25, 1981, as amended (7 U.S.C. 147b), the Secretary of Agriculture declared that there is an emergency that threatens the agricultural production industry in the U.S., and authorized the transfer and use of funds from the Commodity Credit Corporation of the USDA in FY 2001 for the continuation of ORV programs to address rabies problems in several eastern states and Texas (65 FR 76606-76607, December 7, 2000). Additional CCC funds continue to be provided to augment the funding obtained through the appropriations process and support the continuation and expansion of ORV programs to ensure that raccoon and gray fox rabies spread was contained.

The APHIS-WS program is proposing to continue or expand federal cooperation through funding and direct involvement in these programs. APHIS-WS proposes to expand the ORV program to include a total of 26 states and the District of Columbia. The states where APHIS-WS involvement would be continued or expanded include: Alabama, Connecticut, Delaware, Florida, Georgia, Indiana, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Mississippi, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Vermont, Virginia, and West Virginia. Figure 1-3 shows the states involved in the proposed action (blue and yellow). The states shown in blue have been included in the proposed program in the event contingency actions must be implemented to combat potential future rabies outbreaks.

The emergency federal funds authorized above, along with other federal funds would be used to: 1) purchase ORV baits and participate in the distribution of ORV baits by air and ground placement; 2) provide other forms of assistance in monitoring rabies and determining the effectiveness of the ORV programs through collection and testing of samples from wild animal specimens; and, 3) if necessary, participate in implementing contingency plans that may involve the localized reduction of target species populations through lethal means or trap-vaccinate-release programs.

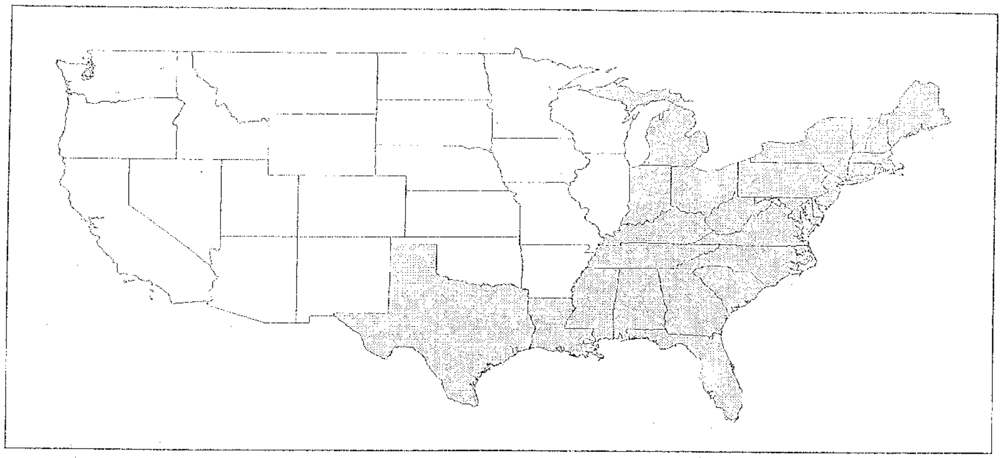


Figure 1-3. Blue and Yellow: States in which APHIS-WS is proposing to continue or expand assistance to and participation in oral rabies vaccination programs. Blue: indicates those states which have been included in the program for contingency action planning in the event of rabies outbreaks.

The ORV that would be used is the V-RG vaccine in any of several types of baits as described in Section 1.1.5. The intent of the bait distribution is to orally vaccinate wild raccoons in portions of the above states with the exception of Texas. Similar programs would be directed at gray foxes in west-central Texas and coyotes in southern Texas. The primary goals of the program are to: 1) stop the forward advance of these strains of rabies from areas where they now occur by immunizing portions of target species populations along the leading edges of the rabies fronts; and 2) reduce the incidence of rabies cases involving wild and domestic animals and rabies exposures to humans in the areas where the ORV programs are conducted. If the ORV program is successful in stopping the forward advance of these strains, then the ultimate goal could include elimination of these rabies variants.

The areas over which the ORV baits would be distributed and from which animal specimens would be collected could be anywhere in the above listed 26 states and District of Columbia. The ORV zones would be delineated based on the most current distribution of rabies cases and the expected direction of disease spread. Vaccination zones would be determined in cooperation with state rabies task forces, state health departments, and/or other state agencies with jurisdiction over vaccine use and application in wildlife and domestic animal species. Figures 1-4 and 1-5 show the current areas anticipated to be treated or to continue treatment with ORV baits in the involved states. Figure 1-6 depicts the counties located within the current ORV zone and results of enhanced rabies surveillance conducted in the eastern U.S. in 2003. Pending the verification of legal authorities to do so, ORV baits would be distributed by the states over a variety of classes of land ownership, including private, public, tribal, and other state and federal lands. Each individual bait would have a warning label advising persons not to handle or disturb the bait along with a toll-free telephone number to call for further information..

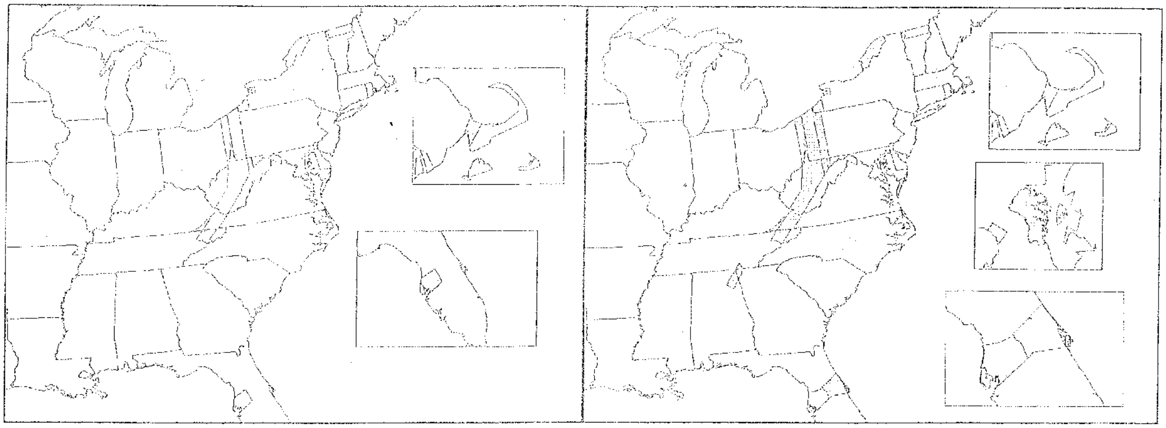


Figure 1-4. Left: Current oral rabies vaccination barrier zones in the U.S. Right: Examples of anticipated oral rabies vaccination barrier zones where APHIS-WS would continue or expand participation in and assistance to ORV programs to stop the westward spread of raccoon rabies. ORV baits would be distributed in these and perhaps other zones under the proposed action to vaccinate wild raccoons and form barriers to further spread of the disease.

Wild animal collections for purposes of monitoring would be conducted using a variety of live capture or lethal methods. Information from raccoons would be predominantly collected from cage-trapped individuals that, if apparently healthy, would normally be released at or near their site of capture. The requisite sample from coyotes would be obtained primarily by aerial or ground-based shooting from sample areas within the ORV zones. Gray fox samples would be obtained by ground shooting and various capture methods including leghold traps, cage traps, and snares. Only legally approved methods would be used in all animal sample collection areas to provide critical data for the evaluation of project effectiveness. Project effectiveness would be based in large part on the percentage of ORV baits consumed in populations of target species, the presence of sufficient levels of serum neutralizing antibodies in a large enough percentage of the population to resist the spread of rabies, and the absence of the rabies strain targeted for control with ORV beyond the vaccination barrier established to prevent spread of the virus.

Biological data such as sex, age, and weight would also be collected to determine if baits are consumed differently by various age or sex groups. For example, juvenile male raccoons are the most likely age/sex group to disperse from the home range in which they were born and are, therefore, the cohort which would be most important to vaccinate. Enhanced surveillance (using sick and strange-acting target and nontarget wildlife, nuisance wildlife captured during other WS damage management activities, and road-killed wildlife) would be conducted to track the occurrence of rabies within the ORV bait zones and to determine the epizootic front of the virus, so that ORV and other measures (i.e., trap-vaccinate-release) may be implemented ahead of these cases to maintain the integrity of the barrier.

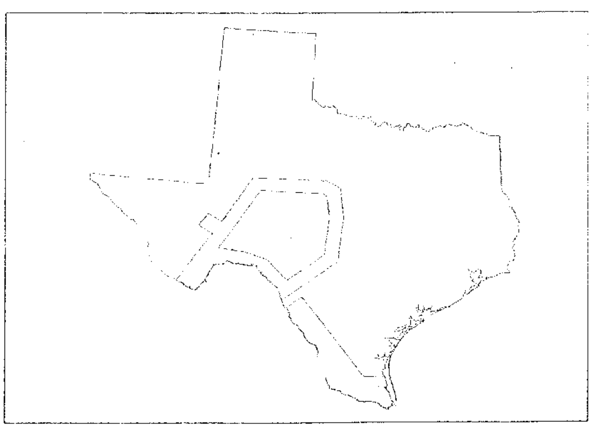


Figure 1-5. Anticipated oral rabies vaccination zones where APHIS-WS is proposing to continue or expand assistance to and participation in ORV programs in Texas to stop the spread of gray fox (gray area indicated) and coyote rabies (yellow area indicated). These are anticipated areas of need; actual areas treated with ORV baits may include other areas of the state where coyote or gray fox rabies outbreaks occur.

In the event that the targeted rabies strains advance beyond the barriers created by the ORV zones, contingency plans may be implemented by the involved states that could include local population reduction of the target wildlife species using lethal means combined with the distribution of higher densities of ORV baits in and around such areas. Any localized lethal population reduction efforts that would occur would likely be integrated with hand or aerial placement of ORV baits in and around the population reduction area to restore the integrity of the ORV barrier and prevent further spread of rabies. APHIS-WS may, as part of the proposed action, assist in such efforts by providing funds, personnel, or equipment to capture and/or kill target species. Should this occur, methods used would involve any of those described above for the collection of wild animal specimens. In Texas, an additional method that could be used to remove gray foxes and coyotes would be sodium cyanide in the M-44 device which is approved by the U.S. Environmental Protection Agency for this purpose. In Texas, APHIS-WS has in the past been involved in several localized efforts to reduce coyote numbers around small towns and cities to reduce rabies risks and could be called upon to conduct similar activities in the future.

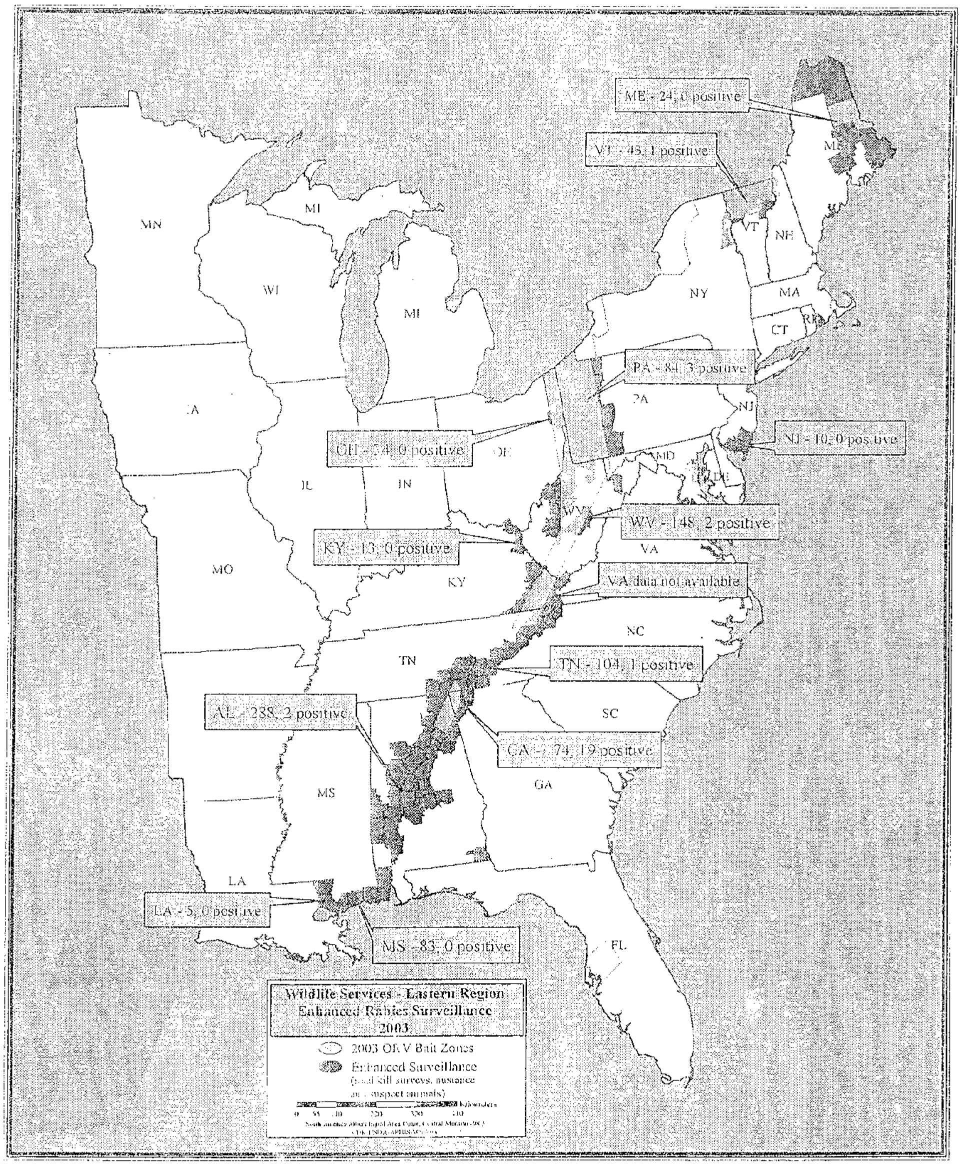


Figure 1-6. Counties and results of enhanced rabies surveillance conducted in the eastern U.S. in 2003. The Blue Tabs indicate the number of animals tested and numbers of positive raccoon strain cases found.

1.3 AUTHORITIES

1.3.1 Federal Authorities.

Act of March 2, 1931 (7 U.S.C. 426-426b and 426c). APHIS-WS is authorized to conduct programs to address wildlife-caused disease problems, including the suppression of rabies in wildlife, by the Act of March 2, 1931, as amended.

7 U.S.C. Sec. 147b. This law authorizes the Secretary of Agriculture, in connection with emergencies which threaten any segment of the agricultural production industry of the U.S., to transfer from other appropriations or funds available to the agencies or corporations of USDA such sums as the Secretary may deem necessary, to be available only in such emergencies for the arrest and eradication of contagious or infectious diseases of animals. It is under this authority that funds from the federal Commodity Credit Corporation have been transferred to APHIS-WS to expend for the continuation and expansion of ORV programs in the states identified herein (65 FR 76606-76607, December 7, 2000).

Virus-Serum-Toxin Act (21 U.S.C. 151 et seq.). The oral rabies vaccine (RABORAL V-RG®) is licensed for treatment of raccoons and coyotes by the USDA under the Virus-Serum-Toxin Act (VSTA). Animal vaccines shipped in or from the U.S. must be prepared under a USDA license. Animal vaccines may not be imported without a USDA license. Federal regulations implementing the VSTA (9 CFR 103.3) require authorization by APHIS before an experimental biological product can be shipped for the purpose of treating limited numbers of animals as part of an evaluation process. The license for RABORAL V-RG® requires that it be restricted for use in state or federal rabies management programs.

Public Health Service Act. The CDC, located in Atlanta, Georgia, is an agency of the U.S. Department of Health & Human Services. CDC's mission is to promote health and quality of life by preventing and controlling disease, injury, and disability. CDC is authorized under 42 U.S.C. 241 to render assistance to other appropriate public authorities in the conduct of research, investigations, demonstrations, and studies relating to the causes, diagnosis, treatment, control, and prevention of physical and mental diseases and impairments of man. In addition, under 42 U.S.C. 243(a), the Secretary of Health & Human Services, may assist states and their political subdivisions in the prevention and suppression of communicable diseases.

1.3.2 State and Local Authorities.

Each of the states involved in this proposed action has a state agency or agencies with authority under state law to approve, conduct or coordinate rabies control programs. APHIS-WS involvement in rabies control in each state has previously occurred and, under the proposed action, would only occur in complete cooperation with the appropriate state agency(ies) and in accordance with state authorities as identified by those agencies.

With regard to ORV programs, it is the various cooperating states that exercise their authorities under state law to propose or approve the distribution of ORV baits onto lands owned or managed by a variety of entities including private persons, federal land management agencies [e.g., USDA Forest Service, National Park Service (NPS), and others], state, county, and city governments, and American Indian Tribes. It is critical to the success of establishing and maintaining ORV barriers and, potentially, to the eventual elimination of targeted rabies strains in many areas, that all lands containing substantial amounts of habitat for the targeted carnivore species are included. APHIS-WS would not be making the decision to distribute baits on the various land ownerships. Those decisions would be made by the states. The proposed action assumes that ORV baits would be distributed under state authorities, consistent with pertinent property rights laws and regulations and would include acquiring permission from public land managers and American Indian Tribes when appropriate.

1.4 OTHER RELEVANT FEDERAL LAWS AND REGULATIONS

National Environmental Policy Act (NEPA) (42 U.S.C. 4321 et seq.). The purpose of NEPA is to declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality.

APHIS-WS prepares analyses of the environmental impacts of program activities to meet procedural requirements of this law. APHIS has previously prepared a number of environmental assessments (EAs) to address the environmental effects of experimental programs using V-RG ORV baits and covering the approval of licensing of the vaccine for use in raccoons (see Section 1.5). APHIS-WS also completed an EA (USDA 2001a) and Finding of No Significant Impact (FONSI) (USDA 2001b), dated July 30, 2001; a supplemental FONSI (USDA 2002), dated August 5, 2002; and a supplemental EA (USDA 2003a) and FONSI (USDA 2003b), dated June 12, 2003. These documents analyzed the environmental effects of APHIS-WS involvement in the funding of and participation in ORV programs to eliminate or stop the spread of raccoon rabies in a number of eastern states (New York, Ohio, Vermont, New Hampshire, West Virginia, Virginia, Pennsylvania, Florida, Massachusetts, Maryland, New Jersey, Alabama, Tennessee, Kentucky, Maine, and Georgia) and gray fox and coyote rabies in Texas. APHIS-WS determined the action would not have any significant impact on the quality of the human environment (see Section 1.5). Furthermore, APHIS-WS, in cooperation with the USDA-Forest Service, prepared an EA (USDA 2004e) and FONSI, dated February 12, 2004. This document analyzed the environmental effects of APHIS-WS involvement in the funding of and participation in ORV programs on several National Forest System lands (excluding Wilderness Areas) in the eastern U.S. to eliminate or stop the spread of raccoon rabies. APHIS-WS determined the action would not have any significant impact on the quality of the human environment (see Section 1.5).

APHIS-WS determined that, because of increased federal involvement in ORV programs in recent years, because of the current proposal to continue or expand federal involvement in such programs in additional states, and because of the need for expanded monitoring and surveillance in the event contingency actions must be implemented, further NEPA documentation is appropriate. Therefore, this supplemental EA is intended to meet the NEPA requirement for the proposed action by clearly communicating the scope of federal involvement by APHIS-WS and by determining if there are any substantive new issues or alternatives that should be analyzed.

Endangered Species Act (ESA) (16 U.S.C. 1531 et seq.). It is federal policy, under the ESA, that all federal agencies shall seek to conserve threatened and endangered (T&E) species and shall utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). For actions that "may affect" listed species, APHIS-WS conducts Section 7 consultations with the U.S. Fish & Wildlife Service (USFWS) to ensure that "*any action authorized, funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species . . . Each agency shall use the best scientific and commercial data available*" (Sec.7(a)(2)). APHIS-WS has analyzed the potential for effects on listed species in this supplemental EA and has concluded that the proposed action would not affect any listed species (see Section 4.1.3.2).

National Historical Preservation Act (NHPA) of 1966 as amended (16 U.S.C. 470). The NHPA and its Implementing regulations (36 CFR 800) require federal agencies to: 1) determine whether activities they propose constitute "undertakings" that can result in changes in the character or use of historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the State Historic Preservation Office regarding the value and management of specific cultural, archaeological and historic resources, and 3) consult with appropriate American Indian tribes to determine whether they have concerns for traditional cultural properties in areas of these federal undertakings.

ORV activities described under the proposed action (Section 1.2) do not cause major ground disturbance, do not cause any physical destruction or damage to property, do not cause any alterations of property, wildlife habitat, or landscapes, and do not involve the sale, lease, or transfer of ownership of any property. In general, such methods also do not have the potential to introduce visual, atmospheric, or audible elements to areas in which they are used that could result in effects on the character or use of historic properties. Therefore, the methods that would be used under the proposed action are not generally the types of activities that would have the potential to affect historic properties. If an individual activity with the potential to affect historic resources is planned under an alternative selected as a result of a decision on this EA, then site-specific consultation as required by Section 106 of the NHPA would be conducted as necessary.

Federal Food, Drug, and Cosmetic Act (21 U.S.C. 360). This law places administration of pharmaceutical drugs, including those used in wildlife capture and handling, under the Food and Drug Administration.

Controlled Substances Act of 1970 (21 U.S.C. 821 et seq.). This law requires an individual or agency to have a special registration number from the federal Drug Enforcement Administration (DEA) to possess controlled substances, including those that are used in wildlife capture and handling.

Animal Medicinal Drug Use Clarification Act of 1994 (AMDUCA). The AMDUCA and its implementing regulations (21 CFR Part 530) establish several requirements for the use of animal drugs, including those used to capture and handle wildlife in rabies management programs. Those requirements are: (1) a valid "veterinarian-client-patient" relationship; (2) well defined record keeping; (3) a withdrawal period for animals that have been administered drugs; and (4) identification of animals. A veterinarian, either on staff or on an advisory basis, would be involved in the oversight of the use of animal capture and handling drugs under the proposed action. Veterinary authorities in each state have the discretion under this law to establish withdrawal times (i.e., a period of time after a drug is administered that must lapse before an animal may be used for food) for specific drugs. Animals that might be consumed by a human within the withdrawal period must be identified; the Western Wildlife Health Committee of the Western Association of Fish and Wildlife Agencies has recommended that suitable identification markers include durable ear tags, neck collars, or other external markers that provide unique identification (WWHC *undated*). APHIS-WS establishes procedures in each state for administering drugs used in wildlife capture and handling that must be approved by state veterinary authorities in order to comply with this law.

Clean Air Act of 1970 as amended (42 U.S.C. 7401). The Clean Air Act is a comprehensive federal law that regulates air emissions from area, stationary, and mobile sources.

1.5 RELATIONSHIP TO OTHER ENVIRONMENTAL DOCUMENTS

A number of other NEPA documents have been prepared that analyzed the potential environmental effects of ORV programs and the methods used in rabies monitoring and surveillance. Pertinent information from those analyses has been incorporated by reference into this supplemental EA.

Wildlife Services Programmatic EIS. APHIS-WS has issued a final Environmental Impact Statement (EIS) (USDA 1997j) and Record of Decision on the National APHIS-WS program.

EA and Finding of No Significant Impact – Oral Vaccination to Control Specific Rabies Virus Variants in Raccoons, Gray Foxes, and Coyotes in the United States. This EA (USDA 2001a) and FONSI (USDA 2001b), dated July 30, 2001, supplemental Decision/FONSI, dated August 5, 2002 (USDA 2002); and a supplemental EA (USDA 2003a) and FONSI (USDA 2003b), dated June 12, 2003, analyzed the environmental effects of APHIS-WS involvement in the funding of and participation in ORV programs to eliminate or stop the spread of raccoon rabies in a number of eastern states (Alabama, Georgia, Florida, Kentucky, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Tennessee, Vermont, Virginia, and West Virginia) and gray fox and coyote rabies in Texas. APHIS-WS determined the action would not have any significant impact on the quality of the human environment.

EA and Finding of No Significant Impact - Oral vaccination to Control specific rabies virus variant in raccoons on National Forest System lands in the United States. This EA (USDA 2004e) and FONSI, dated February 12, 2004, analyzed the potential environmental effects of a proposal to expand the involvement of the APHIS-WS program in ORV programs to portions of National Forest System lands, excluding Wilderness Areas, in a number of eastern states. The National Forest System lands where APHIS-WS involvement would be expanded may be located within the states of Alabama, Georgia, Florida, Kentucky, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Vermont, Virginia, and West Virginia. Numerous National Forest System lands are located within current and potential ORV barrier zones. To effectively combat this strain of the rabies virus, it has become increasingly important to bait these large land masses.

EA and Finding of No Significant Impact – Oral Rabies Vaccination Program. APHIS-WS was a cooperating agency in the preparation of this EA (USDI 2004) and FONSI, dated June 28, 2004, which analyzed the environmental effects of NPS participation in ORV programs on fifteen NPS units in the states of Alabama, Florida, Georgia, North Carolina, and Tennessee in the effort of stopping the spread of a specific raccoon rabies variant or "strain" of the rabies virus and reducing or eliminating this strain of the virus from the eastern United States. The NPS determined the action would have a negligible impact on the quality of the human environment.

EA and Finding of No Significant Impact – Oral Rabies Vaccination Program for Big Bend National Park, Guadalupe Mountains National Park, and Amistad National Recreation Area in Texas. APHIS-WS was a cooperating agency in the preparation of this EA (USDI 2003) and FONSI, dated June 13, 2003, which analyzed the environmental effects of NPS participation in ORV programs to eliminate or stop the spread of gray fox rabies on three NPS units in Texas. The NPS determined the action would have a negligible impact on the quality of the human environment.

EA and Finding of No Significant Impact – Proposed Issuance of a Conditional United States Veterinary Biological Product License to Rhone Merieux, Inc., for Rabies Vaccine, Live Vaccinia Vector. This EA and its FONSI, dated April 7, 1995, were prepared by APHIS and concluded there would be no significant impact on the quality of the human environment from the decision to issue the conditional license mentioned above (USDA 1995a). The conditional license approved the use of V-RG in raccoon rabies control programs administered under the direction of state or federal government agencies. Mitigative measures required under the decision included public education and notification efforts prior to distributing the baits, and the placement of warning labels on each vaccine-laden bait.

EA and Finding of No Significant Impact – Proposed Field Application of an Experimental Rabies Vaccine, Live Vaccinia Vector, in South Texas. This EA and its Decision/FONSI, completed in 1995, analyzed the environmental effects of experimental distribution of ORV baits containing V-RG to eliminate and stop the spread of coyote rabies in South Texas (USDA 1995b). APHIS determined the action would not have any significant impact on the quality of the human environment.

EAs and Findings of No Significant Impact on proposed field trials/tests of live experimental vaccinia-vector recombinant rabies vaccine for raccoons. APHIS analyzed the potential environmental impacts of six separate field trials or tests of the recombinant V-RG vaccine in several northeastern states. In EAs and Decisions/FONSIs covering those actions, (USDA 1991, 1992, 1993, 1994a, 1994b, 1994c), APHIS determined that none of the actions would have any significant impact on the quality of the human environment.

Risk Analyses for ORV using the V-RG recombinant virus. Two formal risk analyses on the rabies vaccine -- live vaccinia vector (i.e., the recombinant V-RG vaccine) have been prepared previously by APHIS (USDA undated *a*, USDA undated *b*). Both analyses concluded the risk of adverse animal safety, human safety, or other environmental effects to be low.

(Nine) EAs and Findings of No Significant Impact - Predator Damage Management in (Brownwood, Canyon, College Station, Fort Stockton, Fort Worth, Kerrville, Kingsville, San Angelo, and Uvalde) District(s) of the Texas Animal Damage Control Program. These EAs and their Decisions/FONSIs, dated March, 1997, evaluated the environmental impacts of implementing various methods of predator damage management in nine districts in Texas, including methods proposed herein for collection of gray foxes and coyotes as part of rabies ORV program monitoring and surveillance activities. APHIS-WS determined that none of the district programs would have any significant impact on the quality of the human environment (USDA 1997a, 1997b, 1997c, 1997d, 1997e, 1997f, 1997g, 1997h, and 1997i).

1.6 EXECUTIVE ORDER ON ENVIRONMENTAL JUSTICE

Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations requires federal agencies to analyze disproportionately high and adverse environmental effects of proposed actions on minority and low-income populations. APHIS-WS has analyzed the effects of the proposed action and determined that implementation would not have adverse human health or environmental impacts on low-income or minority populations.

1.7 EXECUTIVE ORDER ON PROTECTION OF CHILDREN FROM ENVIRONMENTAL HEALTH AND SAFETY RISKS

Executive Order 13045 was passed to help protect children who may suffer disproportionately from environmental health and safety risks for many reasons. ORV activities as proposed in this supplemental EA would only involve legally available and approved methods that have been subjected to safety evaluations and testing. The vaccinia virus used as a carrier of the rabies glycoprotein is the same type of virus that was used in smallpox eradication, although more attenuated or weakened (USDA 1991, p. 39). The analysis in Section 4.1.1 of this supplemental EA supports a conclusion of very low to no risk of adverse effects on children from the ORV baiting strategy. Implementation of the proposed action would not increase environmental health or safety risks to children, but would in fact reduce such risks by minimizing the potential for children to contract rabies. Children are particularly at risk from rabies because they are more prone to experiencing "undetected" or "unappreciated" exposures (Huntley et al. *unpublished* 1996) that do not lead to post-exposure vaccine treatments. Therefore, federal involvement in ORV programs is consistent with and helps to achieve the goals of EO 13045.

1.8 DECISION TO BE MADE

- Based on the scope of this supplemental EA, the decisions to be made are:

- Should APHIS-WS continue or expand its involvement in ORV programs in the states listed above and the District of Columbia?

- If not, should APHIS-WS attempt to implement one of the alternatives as described in this supplemental EA?

- Would implementing the proposed action or one of the other alternatives have significant adverse impacts on the quality of the human environment requiring preparation of an EIS?

1.9 GOALS

As stated in the description of the proposed action, the primary goals of the program are to:

- stop the forward advance of these strains of rabies from areas where they now occur by immunizing portions of target species populations along the leading edges of the rabies fronts; and

- reduce the incidence of rabies cases involving wild and domestic animals and rabies exposures to humans in the areas where the ORV programs are conducted.

The states that would be involved in the proposed action have established, or are in the process of establishing, plans for the implementation of ORV or contingency action programs. The proposed action would be consistent with such plans and any statements of goals and objectives as they are developed by the involved states.

1.10 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT ANALYSIS

1.10.1 Actions Analyzed.

This supplemental EA evaluates the environmental effects of continued or expanded APHIS-WS funding of and participation in ORV programs to eliminate or stop the spread of raccoon rabies in a number of eastern states and the District of Columbia and gray fox and coyote rabies in Texas.

1.10.2 Period for which this Supplemental EA is Valid.

This supplemental EA would remain valid until APHIS-WS determines that new needs for action, new unforeseen significant issues, or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document would be supplemented or revised pursuant to NEPA. Review of the EA would be conducted each year by APHIS-WS to ensure that the EA and the analyses contained herein were still appropriate.

1.10.3 Site Specificity.

This supplemental EA analyzes potential impacts of continued or expanded APHIS-WS participation in ORV programs in the states described in Section 1.2. Because the proposed action is to assist the affected states in accordance with plans, goals, and objectives developed by those states, the proposed action could involve APHIS-WS participation in ORV bait distribution, monitoring and surveillance, and/or local population reduction of target species anywhere in those states where the need has been identified by the appropriate state agencies.

This supplemental EA identifies as much as possible the typical habitat areas and the specific areas that are currently known to be in need of ORV program action. However, the location of every wildlife rabies outbreak that would trigger use of ORV cannot be predicted. Implementation of emergency response and contingency action plans that involve localized population suppression of target species could similarly be needed anywhere in the involved states where outbreaks of the targeted rabies strains occur. In addition, changes in funding levels over time could create changes in ORV program activities, such as increasing or decreasing the size of the ORV barrier zone and other areas to be baited and varying the types of monitoring and surveillance and research conducted. Planning for the management of rabies epizootics must be viewed as being conceptually similar to federal or other agency actions whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they will occur are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire and police departments, emergency clean-up organizations, insurance companies, etc.

Although some of the sites where wildlife rabies outbreaks will occur can be predicted, all specific locations or times where such outbreaks will occur in any given year cannot be predicted. Thus, this supplemental EA addresses the substantive environmental issues that pertain to ORV use and monitoring/surveillance activities, and, if necessary, localized target species population reduction wherever these activities might occur in the states identified herein. The analyses in this supplemental EA are intended to apply to any action that may occur *in any locale* and at *any time* within the analysis area. In this way, APHIS-WS believes it meets the intent of NEPA with regard to site-specific analysis and that this is the only practical way for WS to comply with NEPA and still be able to accomplish its mission.

1.11 SUMMARY OF PUBLIC INVOLVEMENT EFFORTS

Issues related to the proposed action were identified through involvement and planning/scoping meetings with state health departments, other state and local agencies, academic institutions, the Ontario Ministry of

Natural Resources, and the CDC. Additional efforts to determine further issues that the public might have with this action were made through a Federal Register Notice (66 FR 13696-13700, March 7, 2001) and by a second Federal Register Notice (66 FR 27489, May 17, 2001) making the EA available to the public for review and comment prior to an agency decision. A letter was sent to potentially affected or interested American Indian Tribes to assure their opportunity to be involved in the EA process. Comments received were reviewed to identify any substantive new issues or alternatives not already identified for analysis. A third Federal Register Notice (66 FR 45835-45836, August 30, 2001) was published announcing the availability of the EA and Decision/Finding of No Significant Impact (FONSI) (USDA 2001a, 2001b). A Notice of Availability for a subsequent Decision/FONSI published through a Federal Register Notice (67 FR 44797-44798, July 5, 2002) (USDA 2002). A Notice of Availability for a supplemental EA (USDA 2003a, 2003b) and Decision/FONSI was published through a Federal Register Notice (68 FR 38669-38670, June 30, 2003) (USDA 2003a). A Notice of Availability for an EA and Decision/FONSI was published through a Federal Register Notice (69 FR 7904-7905, February 20, 2004) (USDA 2004e) in cooperation with the USDA Forest Service to expand ORV program assistance to National Forest System lands, excluding Wilderness Areas, in several eastern states. A Notice of Availability for this supplemental EA and Decision/FONSI or Notice of Intent to prepare an EIS will be published in the Federal Register once a decision is reached.

2.0 CHAPTER 2: ISSUES AND AFFECTED ENVIRONMENT

2.1 ISSUES

From public input received in response to a Federal Register Notice (66 FR 13696-13700, March 7, 2001), from interactions and planning/scoping meetings held with state and local departments of health and the CDC, and based on the previous EAs and FONSIs (USDA 2001a, 2001b, 2002, 2003a, 2003b, and 2004e) the following issues were determined to be germane to the proposed action and were considered in detail:

- Potential for adverse effects on people that become exposed to the vaccine or the baits.
- Potential for adverse effects on target wildlife species populations.
- Potential for adverse effects on nontarget wildlife species, including threatened or endangered species.
- Potential for adverse effects on pet dogs or other domestic animals that might consume the baits.
- Potential for the recombined V-RG virus to "revert to virulence" and result in a virus that could cause disease in humans or animals.
- Potential for the V-RG virus to recombine with other viruses in the wild to form new viruses that could cause disease in humans or animals.
- Potential for aerially dropped baits to strike and injure people or domestic animals.
- Cost of the program in comparison to perceived benefits.
- Humaneness of methods used to collect wild animal specimens critical for timely program evaluation or to reduce local populations of target species under state contingency plans.

2.2 OTHER ISSUES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE

2.2.1 Potential for Drugs Used in Animal Capture and Handling to Cause Adverse Health Effects in Humans that Hunt and Eat the Species Involved.

Among the species to be captured and handled under the proposed action, this issue is expected to only be of concern for raccoons, which are hunted and sometimes consumed by people as food. Drugs used in capturing and handling raccoons for surveillance and monitoring purposes in rabies management programs include ketamine hydrochloride, xylazine (Rompun), and a mixture of tiletamine and zolazepam (Telazol). Meeting the requirements of the AMDUCA (see Section 1.4) should prevent any significant adverse impacts on human health with regard to this issue. Mitigation measures that would be part of the standard operating procedures followed in each state include:

- All drugs used in capturing and handling raccoons and other animals would be under the direction of state or federal veterinary authorities, either directly or through procedures agreed upon between those authorities and APHIS-WS.
- As determined on a federal- or state-level basis by these veterinary authorities (as allowed by AMDUCA), ORV program participants may choose to avoid capture and handling activities that utilize immobilizing drugs within a specified number of days prior to the hunting or trapping season for the target species to avoid release of animals that may be consumed by hunters prior to the end of established withdrawal periods for the particular drugs used. However, capture and handling activities would likely extend into the hunting season during

late summer/fall ORV baiting schedules. Therefore, target species would either be marked or euthanized if immobilizing drugs are used within 30 days of hunting or trapping seasons. These measures would be taken to avoid release of animals that could be consumed by hunters prior to the end of established withdrawal periods for the particular drugs used.

- Animals that have been immobilized and released would be ear tagged or marked in some other way to alert hunters and trappers that they should contact APHIS-WS personnel before consuming the animal.

By following these procedures in accordance with AMDUCA, rabies management programs would avoid any significant impacts on human health with regard to this issue.

2.2.2 Potential for Drugs Used in Animal Capture and Handling to Cause Adverse Health Effects in Scavengers or Other Nontarget Animals that May Consume the Species Involved.

Drugs used in the capturing and handling of raccoons, gray foxes, or coyotes for surveillance and monitoring purposes in the rabies management program include ketamine hydrochloride, xylazine (Rompun), and a mixture of tiletamine and zolazepam (Telazol). These drugs are generally injected intravenously or intramuscularly and, less-often, subcutaneously. Oral delivery of immobilizing drugs may be used to calm animals caught in traps. For example, oral delivery of ketamine can calm the animal enough to allow injection of additional drug via syringe (USDA 2001c). However, oral delivery is not recommended for anesthetizing the animal due to the much higher dosage required to compensate for the slower uptake rate and correct dosages cannot be guaranteed (USDA 2001c).

APHIS-WS personnel would not release an animal until it has returned to full and normal function, thereby reducing its chances of succumbing to potential predators or other dangers. Most immobilizing drugs used, such as ketamine and xylazine, are metabolized and excreted within hours after the animal returns to full function (Dr. L. Bigler, New York State Animal Health Diagnostic Laboratory, pers. comm. 2004). In addition, reversal agents, such as yohimbine, may be used to rouse the animal more quickly. Therefore, if a previously immobilized animal dies in the field sometime later, even if a scavenging animal were to ingest an entire animal previously immobilized, they should suffer no adverse effects (Dr. G. Gathright, DVM, APHIS-WS, National Wildlife Research Center, pers. comm. 2004). Furthermore, the scavenger would be consuming the animal by oral route, thus requiring a much larger dosage of the drug. Immobilizing drugs would produce carcasses that are not considered toxic to scavengers (USDA 2001c). If an animal must be euthanized, APHIS-WS personnel would remove it from the field immediately, thereby eliminating the chance of scavengers finding the carcass. As a result of these factors, immobilizing drugs would have no adverse effect on scavengers or predators that consume previously immobilized animals.

2.2.3 Potential for Adverse Impacts on Wildlife from Aircraft Overflights Conducted in ORV Programs.

The concern here is that certain wildlife species such as bald eagles and trumpeter swans (A. Montoney, APHIS-WS, pers. comm. 2001) might be disturbed by the aircraft used in ORV bait distribution to the point that they are adversely affected.

USDI (1995) reviewed studies on the effects of aircraft overflights on wildlife. The report revealed that a number of studies have documented responses by certain wildlife species that suggest adverse impacts could occur. Few if any studies have proven that aircraft overflights cause significant adverse impacts on populations, although the report stated it is possible to draw the conclusion that impacts to wildlife populations are occurring. It appears that some species will frequently or at least occasionally show adverse responses to even minor overflight occurrences. In general, it appears that the more serious potential impacts occur when overflights are *chronic* (i.e., they occur daily or more often over long periods of time). Chronic exposure situations generally involve areas near commercial airports and military flight training facilities. ORV program aerial bait distribution activities are not chronic, but typically occur only once or twice per year. They are typically conducted at about 500 feet (152.4 meters) above ground level and only fly momentarily over any one point on the ground during any given bait distribution flight. The aircraft do not circle over areas repeatedly, but fly in straight "transect" lines for purposes of bait distribution.

Some examples of species or species groups that have been studied with regard to this issue and APHIS-WS determination of potential impacts from ORV aerial overflights are as follows:

- Colonial Waterbirds. Kushlan (1979) reported that low level (390 feet followed by a second flight at 200 feet) overflights of 2-3 minutes in duration by a fixed-wing airplane and a helicopter produced no "drastic" disturbance of tree-nesting colonial waterbirds, and, in 90 percent of the observations, the individual birds either showed no reaction or merely looked up. ORV program overflights typically occur at about 500 feet above ground and would only fly momentarily over any one point on the ground. Thus, it appears that ORV program overflights would result in little or no disturbance to colonial waterbirds.

- Greater Snow Geese. Belanger and Bedard (1989, 1990) observed responses of greater snow geese (*Chen caerulescens atlantica*) to human-induced disturbance on a sanctuary area and estimated the energetic cost of such disturbance. They observed that disturbance rates exceeding two per hour reduced goose use of the sanctuary by 50 percent the following day. They also observed that about 40 percent of the disturbances caused interruptions in feeding that would require an estimated 32 percent increase in nighttime feeding to compensate for the energy lost. They concluded that overflights of sanctuary areas should be strictly regulated to avoid adverse impacts. ORV program overflights typically occur at about 500 feet (152.4 m) above ground and would only fly momentarily over any one point on the ground. Thus, it appears that ORV program overflights would result in little or no disturbance to snow geese or other waterfowl species.

- Raptors. Andersen et al. (1989) conducted low-level helicopter overflights directly at 35 red-tailed hawk (*Buteo jamaicensis*) nests and concluded their observations supported the hypothesis that red-tailed hawks habituate to low level flights during the nesting period. Their results also showed similar nesting success between hawks subjected to such overflights and those that were not. White and Thurow (1985) did not evaluate the effects of aircraft overflights, but showed that ferruginous hawks (*Buteo regalis*) are sensitive to certain types of ground-based human disturbance to the point that reproductive success may be adversely affected. However, military jets that flew low over the study area during training exercises did not appear to bother the hawks, and neither were they alarmed when the researchers flew within 100 feet in a small fixed-wing aircraft (White and Thurow 1985). White and Sherrod (1973) suggested that disturbance of raptors by aerial surveys with helicopters may be less than that caused by approaching nests on foot. Ellis (1981) reported that 5 species of hawks, 2 falcons, and golden eagles were "incredibly tolerant" of overflights by military fighter jets, and observed that, although birds frequently exhibited alarm, negative responses were brief and never limiting to productivity. These studies indicate that overflights by ORV program aircraft should have no significant adverse impacts on raptor populations by affecting nesting success.

- Bald Eagles. Several studies have shown that bald eagles (*Haliaeetus leucocephalus*) elicited varied responses (e.g., no response, alert, agitation, or flushing) by overflights of different types of aircraft such as military jets, fixed-wing aircraft, light planes, and helicopters (Grubb and Bowerman 1997, Watson 1993, Stalmaster and Kaiser 1997). Helicopters appeared to produce the greatest response, with military jets second, and fixed wing and light planes third (Grubb and Bowerman 1997, Watson 1993, Stalmaster and Kaiser 1997). The frequency of response and frequency of flight by bald eagles both increased through the nesting season from February to June (Grubb and Bowerman 1997). However, bald eagles were disturbed at higher rates when there were no young in the nest, when they were away from the nest, or when helicopters were hovering rather than moving (Watson 1993). The distance between eagle and aircraft, overflight duration, number of passes over nest, and type of aircraft appeared to be the most important characteristics influencing eagle responses (Grubb and Bowerman 1997, Watson 1993, Stalmaster and Kaiser 1997). However, Grubb and King (1991) concluded breeding bald eagles in Arizona may have become habituated to aircraft. Habituation was also reported at a nest site near a military air base in Michigan (Grubb et al. 1992, Grubb and Bowerman 1997). Nesting bald eagles have also been surveyed from fixed-wing aircraft with minimal disturbance (Fraser et al. 1985, Watson 1993). In general, conclusions about adverse effects on bald eagles and other raptors from aircraft overflights appear to be speculative. However, no direct evidence of adult or young mortality during helicopter or fixed-wing overflights has been observed (Watson 1993, Fraser et al. 1985). Although habituation may occur, most findings supported the use of buffer zones to distance nesting bald eagles from aircraft activity. Watson (1993) recommended helicopters remain at a distance greater than 197 feet (60 meters) from nests. Stalmaster and Kaiser (1997) suggested a buffer of 1312-2625 feet (400-800 meters) between wintering bald eagles and military activity such as boats, aircraft, and explosions. Grubb and Bowerman (1997) recommended any type of human activity be conducted at a distance of 1312 feet (400 meters) or greater from nesting bald eagles. If this limitation is impractical, they recommended that duration and numbers of aircraft and/or passes are limited to less than 5 minutes and to one aircraft and/or pass. This scenario would be expected for rabies bait distribution overflights, which would only involve one overflight pass, once per year, in which the duration of the pass over a given nest site would only be a few seconds at most.

Overflights for the purposes of ORV bait distribution activities would only occur once or twice per year and aircraft would only fly momentarily over any one point on the ground. The aircraft do not circle over areas repeatedly, but fly in straight "transect" lines for the purposes of bait distribution. The potential impact would be of short-term (only momentary) duration, on a local scale, with negligible intensity and should not add appreciably to the frequency of overflights. The addition of one more overflight per year for ORV bait distribution should not constitute a substantive increase in any effects that might occur as a result of overflights. Furthermore, the types of aircraft used in bait distribution, the DeHavilland (DHC-6) Twin Otter and Beechcraft King Air B200, meet all Federal Aviation Regulation (FAR) requirements regarding noise limits (FAR Part 36). No evidence has been found to indicate harm to eagles or other raptors as the result of an annual overflight. In addition, the annual overflight is even less likely to adversely impact migratory birds if/when flights occur in the fall after the birds have dispersed. Thus, the short-term duration, infrequency, and negligible intensity of flights over any given area, in addition to the tolerance of wildlife of such activity, indicates ORV program overflights would have a negligible adverse environmental impact on wildlife.

2.2.4 Potential for ORV Bait Distribution to Affect Organic Farming.

This issue concerns the potential for ORV baits dropped on crops and livestock operations certified as "organic" under federal regulations to affect the status of the organic certification of such farms. Farmers and livestock producers were concerned they would not be able to sell, label, or represent their harvested crop or plant as organically produced if it had contact with the prohibited substance, which is the vaccine – V-RG (CFR7 Part 205.672). In particular, this concern was raised by a producer of organically raised venison in Ohio (R. Krogwold, Ohio Dept. of Health, pers. comm. 2001) and by an organic farmer in Florida (H. McConnell, APHIS-WS, pers. comm. 2003).

The ORV baits are comprised of a matrix of dog food or fishmeal and an ethylene copolymer which is a plastic material. The purpose of the polymer is to hold the fishmeal attractant together in a block that can withstand being dropped from an airplane and that will not dissolve or crumble apart readily when and if it is exposed to rain or melting snow. The process for producing the bait blocks eliminates all potentially reactive compounds (such as ethylene and vinyl acetate) that might have the potential for uptake by plants or absorption into the tissues of animals that consume the baits. Thus, the inorganic polymer in the ORV baits is totally nonreactive and cannot be absorbed by plants or animals (M. Smith, Bait-Tek, pers. comm. 2001). It is also among the types of materials approved by the Food and Drug Administration for use in producing, manufacturing, packing, processing, preparing, treating, packaging, transporting, or holding food (21 CFR Part 177). Therefore, the fishmeal polymer baits should pose no risk of contaminating crops or animals raised for food and, consequently, should have no effect on the ability of certified organic farms to maintain their status.

Field baiting studies suggest deer are not generally attracted to the ORV baits. Out of more than 4,300 baits exposed to target and nontarget animals in field bait acceptance studies in Georgia, Ohio, and Texas, none were observed to have been taken or consumed by deer, despite the prevalence of deer in the areas where the bait studies were conducted (Linhart et al. *unpublished* 2001). Sulfur compounds are a byproduct of the breakdown of animal proteins, including those found in fishmeal (D. Nolte, APHIS-WS, NWRC, pers. comm. 2001) and are generally repellent to herbivores (Nolte et al. 1994). Therefore, the ORV baits used to address coyote and raccoon rabies problems are probably at least somewhat repellent to deer, which probably accounts in part for the lack of observed bait take by deer in the studies reported in Linhart et al. (*unpublished* 2001). For these reasons, it is unlikely that the ORV baits would be consumed by deer on venison farms that are certified as organic producers.

On April 15, 2003, the USDA-Agricultural Marketing Service (AMS) ruled that ORV bait blocks, consisting of a recombinant vaccine imbedded in fishmeal bound by a polymer binding agent, on an organic operation would not have an adverse impact on organic operations (see USDA-AMS letter in Appendix G). This ruling is posted on the USDA-AMS website at www.ams.usda.gov/nop. The USDA-AMS considers the ORV program to be an emergency disease treatment for the control of rabies and, as such, is addressed under National Organic Program (NOP) Section 205.672, Emergency Pest or Disease Treatment. The USDA-AMS determined that "…in the unlikely event that a bait block breaks and exposes a plant(s) to the vaccine, the organic producer can remove the affected plant(s) with no adverse effect on the operation's certification. This would comply with NOP Section 205.672(a). The organic status of animals feeding on the ORV bait block and not penetrating the vaccine would not be adversely affected. In the unlikely event that an animal consumes the vaccine within the ORV bait block that animal would lose organic status as provided in NOP Section 205.672(b)." The USDA-AMS believes there to be little chance that an organic animal would consume the vaccine within an ORV bait block; however, to reduce the chances of livestock consumption, producers can relocate any bait found within an area containing livestock to a point outside of that area.

2.2.5 Potential for ORV to Cause Abortions in Cattle.

This issue was raised by a cattle producer in Ohio who reported an increase in abortions of pregnant cows following an ORV bait distribution project. V-RG vaccine was tested in a number of wild and domestic animal species, including cattle, and produced no adverse effects (see Section 4.1.3.1). Although pregnant cattle have not been specifically tested, V-RG has produced no adverse effects on gestation in pregnant female raccoons (C. Rupprecht, CDC, pers. comm. to K. Smith, Ohio Dept. of Health 2001). Recently, a woman who was 18 weeks pregnant in Ohio was exposed to the vaccine when she took a bait away from her dog and later delivered a healthy 10-lb. baby boy (see Section 4.1.1.2). ORV program administrators with the Texas Department of Health have not received any reports of this nature despite the distribution of millions of ORV baits in cattle and other livestock production areas since 1995 (E. Oertli, TX Dept. of Health, pers. comm. 2001). In the U.S., approximately 43.75 million doses of V-RG have been distributed by APHIS-WS to date without any other reported concerns of this nature being raised. Therefore, the reported increase in cattle abortions was determined to be coincidental and not related to ORV. The Ohio producer was provided with further information and advice on determining which of a number of other known possible causes of abortions in cattle might be responsible (R. Hale, Ohio

Dept. of Health, pers. comm. 2001).

2.2.6 Potential Human Health Impacts in the Event of Human Consumption of Vaccinated Wildlife.

The issue expressed here is the potential to develop a vaccinia infection from eating a vaccinated raccoon or some other animal that has eaten one or more ORV baits. Dr. Carolin Schumacher of MERIAL, Inc. was consulted to obtain information on this issue. Mahnel (1987) reported results of experiments to determine the stability of poxviruses (which include vaccinia used in the V-RG vaccine). "Naked" vaccinia (i.e., vaccinia found outside of host cells) will be inactivated within minutes by heat above 133 degrees Fahrenheit (56 degrees Celsius), by ultra-violet irradiation (sunlight), or by exposure to acid with a pH of 3 or less[3] (e.g., similar to the acid environment found in the stomach of raccoons which is where the bulk of V-RG vaccine would end up). In contrast, poxviruses can be relatively stable for years in dry dust or in dried lesion crusts.

The vaccinia from V-RG would generally only bind to animal tissues in the mucous membrane of the oral cavity, pharynx and esophagus since V-RG does not have the tendency to spread throughout the animal. Those particular tissues are rarely consumed by humans, but if they were, they would most likely be cooked which would kill the virus. Also, concentrations of vaccinia in those tissues should be low because mucosa is not considered a tissue where the virus tends to accumulate (C. Schumacher, MERIAL, Inc., pers. comm. 2001).

Although cell-bound vaccinia is generally more resistant than free virus, humidity and cellular enzyme activity in the tissues as well as bacterial decomposition (e.g., in the gut of ruminants), normally results in inactivation of the virus. In the environment, inactivation of pox viruses is accelerated by temperature changes (C. Schumacher, MERIAL, Inc., pers. comm. 2001).

The above information suggests that possible sources of contamination with vaccinia would be V-RG dried onto the fur of an animal, ingested virus in the stomach, or cell-bound virus in mucous membranes. However, with the combined activity of sunlight and ultraviolet light, humidity, stomach pH and/or bacteria/enzymes, temperature fluctuations, and cooking heat, the risk to human health should be low, especially when taking into consideration the attenuated or weakened condition of the vaccinia in the V-RG vaccine. Therefore, the potential for adverse health effects from consuming animals that have eaten ORV baits should be negligible.

2.2.7 Potential Impacts on Water Resources, including Aquaculture, Fish, Reptiles, and Amphibians.

A concern has been expressed regarding the potential impacts of unconsumed V-RG vaccine and baits adversely impacting ground and surface water resources and aquaculture through direct and indirect exposure. Baits that are not consumed may remain in the environment for several months after placement, which is dependent upon environmental conditions (precipitation, temperature, etc.) and the physical condition of the baits. Potential impacts to water resources are greatly reduced by the limited number of baits that are dropped in a specific area, the biodegradability of the vaccine liquid and baits, the high consumption rate of ORV baits by animal species, the safety and efficacy of the vaccine, and the Standard Operating Procedures (SOPs) that are used when dropping baits near a large water source. This conclusion is based upon:

- The possibility of a large quantity of ORV baits being exposed to a specific water resource is extremely low due to the bait distribution densities used by the program. Under the proposed program, ORV baits would be distributed from aircraft at an average density of 75 baits per

[3] pH is the measure of acidity or alkalinity of a solution with numbers below 7 representing a progressively more acidic solution. A pH of 3 is highly acidic.

km^2 for raccoons in the eastern U.S., 39 baits per km^2 for gray foxes in Texas, and 27 baits per km^2 for coyotes in Texas.

- The baits are non-toxic. The baits used for the ORV program are small blocks of either dog food or fishmeal that are held together with a polymer binding agent and are considered to be "food grade" materials. Therefore, the unconsumed bait material would biodegrade when exposed to the environment causing little to no effect on water resources.

- The vaccinia virus and other orthopoxviruses will not replicate in water and do not replicate or reproduce themselves in non-warmblooded species (Rupprecht, CDC, pers. comm. 2002). Therefore, ORV is not expected to cause any adverse effects on fish, reptiles, amphibians, or any invertebrate species should any members of these species groups consume ORV baits or otherwise be exposed to the vaccine.

- The ORV baits are readily taken up and consumed by wildlife species, thereby limiting long term exposure to the environment. The likelihood of a bait being consumed is dependent upon several factors including animal population densities (target and non-target species), bait preference, and the availability of alternative food sources. In field tests conducted in the U.S., the majority of ORV baits have been consumed within the first 7 to 14 days after placement, with reports of up to 100 percent of the baits being consumed within a 7 day period (Farry et al. 1998b, Hable et al. 1992, Hadidian et al. 1989, Hanlon et al. 1989a, Linhart et al. 1994, Steelman et al. 2000; USDA 1995a).

- The V-RG virus biodegrades when exposed to the environment. The V-RG virus that is not consumed by the target species or other vertebrates will become inactivated over a relatively short period of time. Persistence and stability of the V-RG virus outside of an organism is highly dependent on ambient temperature and local environmental conditions; the higher the temperature, the quicker the virus will become inactive (USDA 1992; USDA 1995a). For example at temperatures between 68 and 100 degrees Fahrenheit (20 and 37.8 Celsius), the liquid vaccine potency remains stable for approximately 14 to 7 days, respectively, in the un-punctured sachet or inside the bait. In situations where the bait and sachet are damaged inactivation of the V-RG virus will occur more rapidly. A more detailed discussion of the development of ORV baits can be found in Chapter 1.

- Program SOPs limit the possibility of ORV baits being directly dropped into large water sources such as rivers, lakes, and reservoirs. When the aircraft approaches a large body of water the bait dropping equipment is shut off approximately 0.25 mile from the water source to reduce the possibility of ORV baits falling into the water. Nevertheless, due to changing environmental conditions and the limited possibility of human error when operating the bait dropping equipment, there is the possibility that baits may inadvertently be dropped into a body of water. Exposure of the V-RG vaccine into a water source from an intact bait and sachet is highly unlikely. The vaccine is enclosed in a sealed sachet thereby limiting the possibility of the vaccine liquid being directly released into a water source. Even if the vaccine was released into a water source through a damaged or punctured sachet, it is highly unlikely that the vaccine would cause any adverse affects since the vaccine liquid is biodegradable and nontoxic (USDA 1991; USDA *undated a, undated b*).

The above information indicates that V-RG vaccine and baits pose no threat to groundwater or surface water through direct or indirect means.

2.2.8 Effects on Carnivore Populations in the Absence of Rabies.

Concern has been expressed that specific carnivore populations, namely raccoons, may increase in the absence of the rabies virus as a mortality factor, leading to adverse effects on prey populations such as threatened and endangered species. The raccoon strain of the rabies virus has only relatively recently spread, and currently is contiguously distributed from Alabama to Maine, west to the eastern Ohio border with Pennsylvania (Krebs et al. 2000, Kemere et al. 2001). Translocation of rabid raccoons to the mid-Atlantic states has been implicated in establishing a new rabies foci in the mid-1970's (Krebs et al. 1999), from which rabies has spread through the raccoon population at rates averaging about 30 miles/year (48.3 km/year) (Kemere et al. 2001).

Rabies is only one of several diseases that may help regulate carnivore populations. In fact, the article by Guerra et al. (2003) does not support the idea that rabies exists specifically to control raccoon populations. Guerra et al. (2003) state that after an initial peak, populations approach lower 'steady-state' conditions. Based on surveillance data, raccoon rabies did not exist outside a focus in Florida before the 1940s. Therefore, elimination of raccoon rabies should merely create the scenario before raccoon rabies spread in the eastern U.S. (Rupprecht and Smith 1994). No evidence exists that the carrying capacity for raccoons could be increased by the implementation of ORV programs compared to population levels before the introduction of rabies (C. Rupprecht, CDC, pers. comm. 2003).

Prior to the introduction of raccoon rabies into the mid-Atlantic region in the late 1970's, canine distemper was considered a primary disease mortality factor in raccoons, gray foxes, and skunks (Roscoe 1993, Davidson et al. 1992). The epizootiology of canine distemper in raccoons in New Jersey and Florida has been characterized by outbreaks at the end of the mating season in March and with increased movements of young in September (Roscoe 1993, Hoff et al. 1974). Because of the cyclic nature of canine distemper outbreaks (4 year intervals), the wide distribution of canine distemper cases, and the low incidence of the disease between epizootic peaks in New Jersey, Roscoe (1993) proposed an enzootic status for canine distemper for raccoons that becomes epizootic when raccoon densities reach high levels. Evans (1982) found that 50 to 90 percent of raccoons and gray foxes may be incapable of producing protective levels of antibody against the canine distemper virus, implicating it as a potentially important disease mortality factor. Davidson et al. (1992) diagnosed canine distemper in 78 percent of gray foxes studied in the southeastern U.S. and found canine distemper to be more significant as a mortality factor for gray foxes than all other infectious and noninfectious diseases combined. Roscoe (1993) reported that the effects of canine distemper on raccoon populations may diminish if raccoon rabies spreads and that concurrent canine distemper and rabies epizootics may become more common. The dynamics of sympatric rabies and canine distemper are not well understood; however, rabies may compensate for deaths that would have historically occurred due to canine distemper infection. Important attributes of canine distemper include that it is not a zoonotic disease like rabies and, historically, it has been implicated as a virus of importance to carnivore mortality.

2.2.9 The Affected Area Described in the EA includes Some Lands that Have Not Been Identified as Having a Rabid Raccoon Problem.

The affected area of the EA includes some lands that have or have the potential for a raccoon rabies outbreak to occur. ORV baits are distributed based upon vaccination zones. These vaccination zones are determined in cooperation with the involved state rabies task forces, state agencies, and/or other agencies with jurisdiction over vaccine use and application in wildlife and domestic animal species. Vaccination zones are delineated based on the most current distribution of rabies cases and the expected direction of disease spread. Therefore some, all, or none of the lands identified in this EA may be involved in an ORV bait distribution program on an annual basis. Figure 1-4 in Chapter 1 shows the current anticipated ORV zone based upon recent outbreaks of the virus. The states included in this EA were chosen since they have the greatest possibility of being involved in the overall efforts of stopping the northward and westward spread of the raccoon rabies virus in the eastern U.S.

2.2.10 Effects of Nontarget Species Consumption of ORVAC Baits on Program Effectiveness

Consumption of ORV baits by nontarget species is not expected to impact program effectiveness. As described in Section 1.1.5, baits are developed to attract target species. The use of target-preferred baits increases the likelihood of the target species consuming the baits prior to the discovery of baits by nontarget species. Furthermore, bait distribution densities are developed to compensate for the uptake of baits by nontarget species. Baits are distributed at densities that allow raccoons, gray foxes, and coyotes the opportunity to come in contact with intact baits. It has been determined, based upon the success of previous ORV bait distribution activities, that baits should be disbursed at an average density of 27 baits per km^2 in the coyote rabies zone and 39 baits per km^2 in the gray fox rabies zone in Texas. Baiting density averages 75 baits per km^2 in eastern states where raccoon rabies is targeted. In addition, surveillance activities have been and continue to be conducted to assess aerial and/or ground ORV baiting efficacy, summer versus fall baiting schedules, and seasonal raccoon movement in a number of states. Numerous density studies also continue to be conducted in the majority of participating states to determine raccoon densities in relation to habitat, elevation, and numbers of baits distributed. In areas where raccoon densities are low, bait distribution numbers may be reduced (USDA 2004a, 2004c).

2.3 AFFECTED ENVIRONMENT

This section presents some descriptive information on the environment of the areas that would be affected by the proposed action. Other descriptive aspects of the affected environment are included in Chapter 4 in the analysis of effects which is based on environmental and other types of issues identified in Section 2.1.

The area of the proposed action encompasses 25 eastern states and the District of Columbia where raccoon rabies outbreaks currently or are expected to occur and Texas where gray fox and coyote rabies strains occur. APHIS-WS involvement would be continued or expanded in the following states: Alabama, Connecticut, Delaware, Florida, Georgia, Indiana, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Mississippi, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Vermont, Virginia, and West Virginia. Currently, cooperative rabies surveillance activities are conducted in most of the aforementioned states and would likely be expanded to include all listed states (see states depicted in blue and yellow in Figure 1-3 in Chapter 1). ORV baiting programs are conducted or are planned to be conducted in most of the aforementioned states (see states depicted in yellow in Figure 1-3 in Chapter 1).

The potential areas involved in the ORV program are extensive and may cover several land ownership types and diverse land uses, including cultivated agricultural lands, forests, meadows, wetlands, rangelands, and pastures. Aerial distribution of ORV baits would avoid urban and suburban areas that support high human population densities, as well as lakes and rivers. Aerial distribution of baits would primarily target rural areas as well as known areas of habitat suitable for the target species. When aerial distribution by fixed-wing or helicopter aircraft is not practical, baits would be distributed by careful hand placement to help to minimize contact by humans, pets, and other domestic animals.

Figure 1-3 in Chapter 1 shows the states where APHIS-WS would continue or expand assistance to and participation in ORV programs under the proposed action. Figures 1-4 and 1-5 in Chapter 1 show the approximate ORV bait disbursal areas anticipated for 2004 and beyond. It must be kept in mind, however, that ORV baiting activities might be needed, and might therefore be conducted, in other areas within the involved states as part of the proposed action. In addition, the ORV bait disbursal areas would be the primary expected areas where assistance by APHIS-WS is expected to be requested to collect blood, tooth, and other biological samples from target animals for monitoring and surveillance. However, monitoring or surveillance activities by APHIS-WS could also occur anywhere in the respective states where state health or other appropriate agency officials determine there is a need to insure project effectiveness. Implementation of emergency response and contingency action plans that involve localized population suppression of target species could similarly be needed anywhere in the involved states where outbreaks of the targeted rabies strains occur. Furthermore, changes in funding levels over time could create changes in

ORV program activities, such as increasing or decreasing the size of the ORV barrier zone and other areas to be baited and varying the types of monitoring and surveillance and research conducted.

"Major Habitat Types" as described by Ricketts et al. (1999) encompassing the states that would be affected by ORV programs under the proposed action are: Temperate Broadleaf and Mixed Forests (AL, DE, GA, IN, KY, LA, ME, MD, MI, MS, NH, NJ, NY, NC, OH, PA, RI, SC, TN, VT, VA, WV), Temperate Coniferous Forests (AL, FL, GA, LA, MS, NC, SC), Flooded Grassland (FL), Mississippi Riverine Forests (TN, KY), Temperate Grasslands/Savannah/Shrub (IN, LA, TX), and Xeric Shrublands/Deserts (TX). Appendix E shows the "ecoregions" (i.e., broad level ecosystems) that occur in the potentially affected states (Bailey 1995). Ecoregions range from dry desert and grassland-shrub communities in Texas, to humid tropical areas and southern pine and hardwood forest areas in the Southeast, to broadleaf deciduous forest, mixed-deciduous forest and coniferous forest, and boreal forest types in the East and Northeast.

Table 2-1 (USDC 2001) shows some descriptive statistics for the 26 states and District of Columbia proposed for federal assistance by APHIS-WS in ORV programs. These states contain about 62 percent of the U.S. resident population and possess average state population densities that range from about 41 (Maine) to nearly 9,317 (District of Columbia) people per mi^2. Rural area (i.e., nondeveloped) averages 84.6 percent for the 26 states, ranging from approximately 53 percent in New Jersey to almost 91 percent in Texas. Population densities in rural areas are much lower than the statewide average figures shown. The percentage of federal land in each state ranges from 0.3 percent in NY to 22.7 percent in the District of Columbia and averages 4.3 percent of the total area of affected states.

Table 2-1: Some Descriptive Statistics of States Proposed for Federal Assistance by APHIS-WS Oral Rabies Vaccination Programs (data from USDC 2001)

State	Resident population (1000s) from 2000	Population per sq mile from 2000	% popn. in nonmetro-politan areas from 2000	Popn. of nonmetro-politan areas (1000s) from 2000	Total area (1000 acres)	Developed area (1000 acres) from 1997	Rural area (1000 acres) from 1997	% rural area	Land in farms (mil. acres) from 2000 Z<500,000 acres	National Forest Land (1000 acres) from 1999	Total area owned by federal govt. (1000 acres) from 1999	% area owned by federal govt. from 1999
AL	4,447	87.6	30.1%	1,338	32,678	3,728	28,950	86.6%	9	665	1,234	3.8%
CT	3,406	702.9	4.4%	149	3,135	957	2,178	68.2%	Z	0	14	0.5%
DE	784	400.8	20.0%	157	1,266	278	988	64.4%	1	0	8	0.6%
DC	572	9,316.9	0.0%	0	39	--	--	--	N/A	0	9	22.7%
FL	15,982	296.3	7.2%	1,145	34,721	9,223	25,498	67.9%	10	1,147	3,066	8.8%
GA	8,186	141.3	30.8%	2,520	37,295	6,647	30,648	81.2%	11	865	1,864	5.0%
IN	6,080	169.5	27.8%	1,691	23,158	3,089	20,069	86.7%	16	196	501	2.2%
KY	4,042	101.7	51.2%	2,069	25,512	3,185	22,327	86.3%	14	693	1,234	4.8%
LA	4,469	102.6	24.6%	1,099	28,868	4,204	24,664	78.6%	8	604	1,159	4.0%
ME	1,275	41.3	63.4%	808	19,848	1,054	18,794	89.6%	1	53	168	0.8%
MD	5,296	541.8	7.3%	385	6,319	1,511	4,808	61.1%	2	0	167	2.6%
MA	6,349	810.0	4.1%	261	5,035	1,641	3,394	63.6%	1	0	72	1.4%
MI	9,938	174.9	17.8%	1,769	36,492	7,066	29,426	78.8%	10	2,857	4,079	11.2%
MS	2,845	60.6	64.0%	1,821	30,223	3,794	26,429	86.6%	11	1,159	1,647	5.5%
NH	1,236	137.8	40.1%	496	5,769	1,416	4,353	73.3%	Z	827	759	13.2%
NJ	8,414	1,134.2	0.0%	0	4,813	2,037	2,766	53.0%	1	0	119	2.5%
NY	18,976	401.8	7.9%	1,503	30,681	3,979	26,702	85.1%	8	0	106	0.3%
NC	8,049	165.2	32.5%	2,612	31,403	6,811	24,592	73.0%	9	1,244	2,356	7.5%
OH	11,353	277.2	18.8%	2,139	26,222	4,152	22,070	83.5%	15	229	392	1.5%
PA	12,281	274.0	15.4%	1,890	28,804	4,988	23,816	82.1%	8	513	670	2.3%
RI	1,048	1003.2	5.9%	62	677	219	458	56.3%	Z	0	4	0.6%
SC	4,012	133.2	30.0%	1,205	19,374	3,356	16,018	80.3%	5	613	1,107	5.7%
TN	5,689	138.0	32.1%	1,827	26,728	4,131	22,597	83.8%	12	634	1,658	6.2%
VT	609	65.8	72.2%	439	5,937	754	5,183	84.2%	1	368	372	6.3%
VA	7,079	178.8	21.9%	1,550	25,694	5,808	19,886	73.4%	9	1,659	2,284	9.0%
WV	1,808	75.1	57.7%	1,043	15,411	2,159	13,252	85.5%	4	1,033	1,178	7.6%
TX	20,852	79.6	15.2%	3,160	168,218	12,688	155,530	90.9%	130	755	2,568	1.5%
Total	175,077	61.9	18.8%	33,138	674,320	103,560	570,760	84.6%	296	16,114	28,795	4.3%
U.S.	281,422	79.6	19.7	55,453	2,271,343	879,245	1,392,098	71.7%	943	191,910	630,266	27.7%

A number of American Indian Tribes are located in the states included in the proposed action and are shown in Appendix F. State agencies that conduct ORV programs involving the use of APHIS-WS funds or assistance would be responsible for obtaining agreements as appropriate from Tribes.

Chapter 4 contains further affected environment information with respect to target and nontarget species and threatened/endangered species.

3.0 CHAPTER 3: ALTERNATIVES

3.1 ALTERNATIVES CONSIDERED, INCLUDING THE PROPOSED ACTION

Alternative 1. Proposed Action. (preferred alternative). This alternative would involve the continued or expanded use of federal funds by APHIS-WS to purchase V-RG oral vaccine baits and to participate in their distribution under the authorities of the appropriate state agencies in selected areas of the several states listed in Section 1.2 to stop or prevent raccoon, gray fox, and coyote rabies, and to assist with monitoring and surveillance efforts by capturing and releasing or killing target species for purposes of obtaining biological samples. APHIS-WS assistance could also include participation in implementing state contingency plans that involve target species population reduction or concentrated ORV baiting in localized areas if rabies outbreaks occur beyond the designated ORV vaccination barriers to stop such outbreaks from spreading.

Alternative 2. No Action. This alternative would imply no involvement by APHIS-WS in rabies prevention or control in the states identified in Section 1.2. The "No Action" alternative is a procedural NEPA requirement (40 CFR 1502), is a viable and reasonable alternative that could be selected, and serves as a basis for comparison with the other alternatives. The states could still conduct ORV programs without APHIS-WS assistance.

Alternative 3. Live-Capture-Vaccinate-Release Programs. This alternative would involve the live capture of species being targeted (e.g., raccoon, gray fox, coyotes) followed by administration of rabies vaccines by injection and release back into the wild. This strategy has been used in certain localized areas for reducing the incidence and spread of rabies in raccoons (Brown and Rupprecht 1990, Rosatte et al. 1990, Rosatte et al. 1992, Rosatte et al. 1993) and skunks (Rosatte et al. 1990, Rosatte et al. 1992, Rosatte et al. 1993). This method has not been attempted for vaccination of foxes and coyotes because they are much more difficult to capture in cage traps (Baker and Timm 1998). In addition, the use of other traps such as leghold traps and snares, for foxes and coyotes has shown to be problematic in capturing and releasing a large enough population (Rosatte et al. 1993; C. MacInnes, Ontario Ministry of Natural Resources pers. comm. 2001; personal observation of APHIS-WS personnel). Currently, no vaccine is specifically licensed for this type of use (CDC 2000). However, certain injectable vaccines may be used "off-label" under the direction of veterinarians to vaccinate wild animal species in certain situations (J. Mitzel, APHIS-Veterinary Services, pers. comm. 2001). This method generally results in a higher percentage of a raccoon population being vaccinated than ORV, but takes much longer to accomplish in a given area. For example, in Ontario, 7 trappers working from July to October were required to trap and vaccinate 50-85 percent of the raccoons in an area less than 700 $km.^2$ (270.3 mi^2), whereas the same area could have been treated with aerially dropped ORV baits in half a day (C. MacInnes, Ontario Ministry of Natural Resources, pers. comm. 2001).

Alternative 4. Provide Funds to Purchase and Distribute ORV baits without Animal Specimen Collections or Lethal Removal of Animals under Contingency Plans. Under this alternative, APHIS-WS would provide resources for and assistance in ORV bait distribution only and would not engage in or provide funds for the collection of wild animal specimens by APHIS-WS for monitoring and project evaluation purposes or for implementation of localized lethal removal actions under state contingency plans. The states could still conduct these activities without APHIS-WS assistance.

3.2 ALTERNATIVES CONSIDERED, BUT NOT IN DETAIL WITH RATIONALE

3.2.1 Depopulation of Target Species.

This alternative would result in the lethal removal of raccoons (in the eastern states listed) and gray foxes and coyotes (in Texas) throughout the zones where outbreaks of the targeted strains of rabies are occurring or are expected to occur. The goal would be to achieve elimination of the rabies strains by severely suppressing populations of the target animal species over broad areas so that the specific strains of rabies could not be transmitted to susceptible members of the same species. This could theoretically stop the forward advance of the disease and potentially result in elimination of the particular rabies variants as infected animals die from rabies before they could transmit it to other members of the same species.

Localized population reduction has been proposed as part of local programs to address raccoon rabies outbreaks as they are just beginning (Rosatte et al. 1997). This was deemed necessary because by the time a suspected rabies case is confirmed through animal testing, there invariably are other raccoons in the area that have been infected and are incubating the disease, at which point vaccination would not be effective for those individuals (Rosatte et al. 1997).

Population reduction is often suggested as a method to control rabies in wildlife populations since the disease is density dependent (Debbie 1991). Bounty incentives, regulated hunting and trapping, ingestible poisons, and fumigation of dens have all been employed to control populations with varying levels of success. MacInnes (1998) reviewed some of the past efforts to control rabies with population reduction of carrier species and concluded that, with a couple of exceptions, most such efforts have failed. In some of the situations, it could not be determined whether an observed decline or disappearance of rabies cases was attributable to population control or to the disease simply reaching some unexplainable geographical limitation or just dying out on its own (MacInnes 1998). Also, population control as a strategy can be questionable because the leading edges of rabies outbreaks do not necessarily coincide with the edge of the range of the principal "vectors" (e.g., raccoons, gray foxes, and coyotes), nor are they always necessarily related to the population density of such vectors (MacInnes 1998).

Hanlon et al. (1999) reviewed historical efforts to control rabies through population reduction and evaluated the potential for success with this strategy. Information and conclusions they presented are summarized as follows:

> Skunk rabies was successfully controlled in Alberta, Canada by this strategy (Pybus 1988). Success was attributed to a high level of effort during several years, the well-defined behavior of skunks in prairie habitats, and access to an effective method (Pybus 1988). Compensatory changes in carnivore reproduction (i.e., the tendency for larger litters and larger percentages of adult females to have litters) and dispersal (i.e., immigration of animals from surrounding uncontrolled populations) can limit the effectiveness of controlling population numbers of other species in different conditions (Clark and Fritzell 1992, Thompson and Fleming 1994).
>
> Population reduction with toxicants as a broadscale control alternative for rabies is impractical. The only approved toxicant methods currently available are sodium cyanide in the M-44 device (registered for zoonotic disease control involving wild canids), and carbon monoxide-producing gas cartridges that can be used to kill skunks, coyotes, and red foxes in dens. Currently, these methods are primarily used in limited areas of the western U.S. for livestock protection. Presently, population reduction is most likely to be publicly accepted and effective in localized or site-specific scenarios in the U.S. (e.g., reducing the density of raccoon populations in parks where visitors may come in contact with potentially rabid animals).

Population reduction using strychnine baits has reportedly been used successfully to stop the spread of rabies in foxes in Denmark (Gaede 1992). Carcass recovery statistics indicated nontarget species [498 martens (*Martes* sp.), twelve European badgers (*Meles meles*), and four domestic dogs] were killed in slightly greater numbers than the targeted red foxes (n=482). The number of rabies cases declined sharply and the country has reportedly remained free of terrestrial rabies since 1982 (Gaede 1992). Broadscale population control with toxicants is most likely politically infeasible in the U.S. due to opposition by the public and state wildlife agencies.

This alternative was not considered in detail because it would be impractical to obtain approval from the many hundreds of thousands of landowners on whose properties the lethal control methods would have to be conducted. The greatest difficulty with population reduction as a strategy for reducing or eliminating rabies is that the high level of effort must be maintained almost indefinitely and would also undoubtedly be opposed by most members of the public (MacInnes 1998). Population suppression can be a challenge to maintain in many situations due to immigration (of other members of the same species from surrounding populations) and compensatory reproduction (i.e., larger litters and greater percentages of females breeding following population reduction) (Clark and Fritzell 1992, Connolly and Longhurst 1975). These factors can mean local populations can recover to their previous levels within a few months or a year, thus requiring annual or more frequent suppression efforts to maintain such populations at low levels. Nevertheless, temporary localized population suppression activities could be conducted in an integrated program of ORV use as part of the proposed action, but such activities, if conducted at all, would be expected to occur as a part of contingency actions in response to a breach in a vaccination barrier. In Texas, localized population suppression of mammalian predator species for this purpose has been covered in other EAs (USDA 1997a, 1997b, 1997c, 1997d, 1997e, 1997f, 1997g, 1997h, and 1997i).

3.2.2 Population Control through Birth Control.

Under this alternative, APHIS-WS would provide funds or operational assistance to implement one or more methods to control populations of the target species by reducing reproduction. Such methods could involve live capture and surgical sterilization [reviewed by Kennelly and Converse (1997)], the use of chemical reproductive inhibitors placed out in baits or delivery devices (Balser 1964, Linhart et al. 1968), or the application of *immunocontraception* strategies (i.e., vaccines that can cause infertility in treated animals).

The suppression of reproduction over time would eventually reduce the size of target species populations and lead to a reduction in the potential for the spread of rabies by reducing the chances of contact between infected and healthy animals. However, this approach would do nothing in the immediate short term to reduce the risk of rabies spread in the existing populations, since those animals would continue to be present and capable of contracting and passing on the disease. Therefore, this type of strategy would be viewed as a longer term remedy for stopping rabies spread. It would probably not be useful in meeting the immediate needs for stopping a localized outbreak of rabies that occurs beyond designated ORV baiting zones.

Live capture and surgical sterilization of whole local populations of animals would be extremely expensive, time-consuming, and difficult to achieve. Considerable expense would be involved in employing experienced and qualified veterinarians to perform large numbers of surgical procedures on captured animals. From a rabies control standpoint, if all or nearly all of a local population could be live captured, it would be more effective and less costly to administer rabies vaccinations by injection, which is already considered as Alternative 3.

Immunocontraception is a potentially useful concept for mammalian population suppression but is still in the early stages of research and development (Bradley 1995, Miller 1997). Genetically engineered vaccines that cause a target species to produce antibodies against its own sperm or eggs or that affect reproductive hormone functions have been produced (Miller 1997). Several logistical concerns still need to be addressed before this method could be applied successfully in the field. These concerns include: 1) durability of the contraceptive vaccines in baits after distribution in the field; and 2) the limitation of current vaccine designs that require baiting an animal population twice about one month apart to successfully treat individual wild animals (Miller 1997). Furthermore, it is likely that a greater proportion of the population would have to be treated with contraceptive vaccines than with rabies vaccines in order to achieve effective rabies control. Thus, achieving effective control would be more costly and difficult under this alternative than under ORV programs (C. MacInnes, Ontario Ministry of Natural Resources, pers. comm. 2001). In addition, several environmental concerns regarding this strategy still need to be addressed, including safety of the proposed genetically engineered vaccines to humans, other wildlife species, and even nontarget members of the target species - e.g., juveniles that might consume baits (Miller 1997, Guynn 1997, Hanlon and Rupprecht 1997).

No contraceptive agents are currently registered for use on raccoons, gray foxes, or coyotes and, thus, are not legal for use. For all of the above reasons, birth control strategies to control rabies will not be considered further.

3.2.3 Employ Other Types of ORV instead of the V-RG Vaccine.

Under this alternative, APHIS-WS would provide funds to purchase and use "modified-live-virus" (i.e., "attenuated" or weakened strains that have been shown to have little chance of causing rabies in treated animals) or perhaps "killed-virus" (i.e., "inactivated" virus) oral vaccines instead of the V-RG vaccine in ORV baits. Modified-live-virus vaccines include those that have been used in the past in the U.S. to vaccinate domestic animals by injection. Oral baits that employed several strains of these types of virus vaccines have been investigated and used in Europe to stop the spread of rabies in red foxes (Flamand et al. 1993, Artois et al. 1993, Artois et al. 1997). They have also been tested in red foxes in Canada (Lawson et al. 1989, Lawson et al. 1997), and in red foxes and raccoons in the U.S. (Rupprecht et al. 1989, Rupprecht et al. 1992c).

The primary concern with attenuated or "live" virus vaccines (e.g., SAD and ERA) is that they can sometimes cause rabies (Flamand et al. 1993, Pastoret et al. 1992). Flamand et al. (1993) reported that one strain used widely in oral baits in Europe to vaccinate wild red foxes in the 1970s could cause rabies in rodents when injected and that the ability to cause rabies in nontarget animals by other modes (i.e., oral administration) could not be ruled out. Previously used attenuated strains are also "heat sensitive" which can limit their use in warmer seasons or climates (Pastoret et al. 1992). These types of safety concerns with attenuated rabies virus vaccines have been sufficient to prevent their approval for use in the U.S. (Rupprecht et al. 1992c).

"Inactivated" virus or "killed-virus" rabies vaccines are safer than "live" vaccines in that they cannot cause rabies. This type of vaccine was found to be less effective in causing immunity when delivered into the intestinal tract in foxes (only 30 percent effective in test animals) and took two doses to cause immunity in the foxes that were successfully immunized (Lawson et al. 1989). Also, the amounts of virus particles that would have to be ingested in oral baits by wild carnivores to effectively vaccinate them would be 100 to 1000 times the amount of the live-attenuated virus particles required (Rupprecht et al. 1992c). To manufacture vaccines with these amounts would likely be cost-prohibitive (Rupprecht et al. 1992c).

Currently, RABORAL V-RG® is the only vaccine licensed for use in raccoons or approved for experimental use in wild gray foxes and coyotes in the U.S. (CDC 2000). For all of the above reasons, this alternative was not considered further.

3.3 MITIGATION IN STANDARD OPERATING PROCEDURES FOR RABIES ORV PROGRAMS

Mitigation measures are any features of an action that serve to prevent, reduce, or compensate for impacts that otherwise might result from that action. Because of extensive public and interagency involvement in the development of ORV programs and strategies, a number of key mitigating measures are currently part of the standard operating procedures of state-operated ORV programs and include:

- Public information, education, and media announcements would be made available to inform the public about ORV bait distribution activities in each county before they occur. APHIS-WS would coordinate with the appropriate state agency involved in the ORV program on preparing leaflets, posters, press releases, or other media to distribute to the public. Leaflets and posters would be posted in schools, hospitals, campgrounds, visitor centers, and state and county public agency offices. Notification of ORV bait drops would be sent to the state police, state emergency management associations, county hazardous materials coordinators, county cooperative extension agents, state and federal correctional facilities, wildlife rehabilitators, and medical and veterinary facilities within the ORV area informing them of the program and providing information about the ORV bait and vaccine and potential exposure issues.

- Dog food baits for gray fox rabies control are now prepared from poultry-based dog food as concerns were raised regarding the possibility of beef-based dog food containing bovine spongiform encephalopathy (BSE, also known as mad cow disease). To address these concerns, the change to poultry-based products was made on a voluntary basis by MERIAL, Inc. (J. Maki, MERIAL, pers. comm. 2003).

- Toll-free telephone numbers would be advertised in the media and on web sites for people to call for answers to questions.

- In the unlikely event that an adverse vaccinia virus exposure in humans occurs (see recent example described in Section 4.1.1.2), the CDC can make vaccinia immune globulin available to a state on a case-by-case basis to provide a level of additional assurance that such a reaction would be successfully treated.

- Bait distribution navigators would be trained to avoid dropping baits on people or structures. During aerial bait drop operations, the bait dispensing equipment is temporarily turned off over human dwellings, cities, towns, greenhouses, certain sensitive domestic animal pens, and when people are observed below.

- APHIS-WS personnel would adhere to air safety standards.

- ORV baits would not be distributed by aircraft within 0.25 miles of water bodies to reduce the potential of baits entering the water source.

- APHIS-WS personnel would be trained in hand distribution of baits to avoid properties with greater risk of human or pet encounters with baits.

- The appropriate government authorities/officials would be notified prior to distributing ORV baits along the U.S.-Mexico border.

- The appropriate federal land management agency would be notified prior to distributing ORV baits on federal lands.

- Labels would be placed on each ORV bait instructing persons not to disturb or handle them. Labels would contain a toll-free telephone number to call for further information and guidance in the event of accidental exposure to the vaccine (see Figure 1-2 in Chapter 1).

- Methods used to capture raccoons would mainly involve the use of cage traps; however, other methods such as shooting, leg hold traps, and snares may be used in some programs. Animals caught in cage traps that must be sacrificed (killed) for testing, local depopulation, or per cooperating landowner's request would be euthanized in accordance with recommendations by the American Veterinary Medical Association and APHIS-WS policy.

- Capture devices would be checked on a daily basis.

- Field personnel involved in trapping and handling animals for monitoring and surveillance purposes would be immunized against rabies and tetanus.

- All drugs designated for capturing and handling raccoons and other animals would be used under the direction of state or federal veterinary authorities, either directly or through procedures agreed upon between those authorities and APHIS-WS.

- Monitoring and surveillance activities may extend into the hunting season during late summer/fall

ORV baiting schedules. Therefore, target species would either be ear tagged, marked in some other way, or euthanized if capture and handling activities that utilize immobilizing drugs are used within 30 days of hunting or trapping seasons. These measures would be taken to avoid release of animals that may be consumed by hunters prior to the end of established withdrawal periods for the particular drugs used. Most animals administered immobilizing drugs, however, would be released well before state controlled hunting/trapping seasons which would give the drug time to completely metabolize out of the animals' systems before they might be taken and consumed by humans.

4.0 CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

This section analyzes potential environmental consequences using Alternative 1 (the proposed action) as the baseline for comparison with the other alternatives to determine if the real or potential impacts are greater, lesser or the same. Table 4-1 at the end of this chapter summarizes a comparison of the issues and impacts to each alternative.

The following resource values in the states involved in the proposed action would not be significantly impacted by any of the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range.

4.1 Alternative 1 -- Proposed Action (provide APHIS-WS funds to purchase and participate in the distribution of ORV baits in several states; assist in monitoring, surveillance and project evaluation by capturing and releasing or killing target species of carnivores for the collection of blood serum, biomarker and other biological samples; potentially assist in implementing contingency actions that include localized lethal population reduction of target species or concentrated localized ORV baiting).

4.1.1 Potential for Adverse Effects on People that Become Exposed to the Vaccine or the Baits.

Direct tests of the safety of V-RG in humans have not been conducted, for understandable reasons. Prior EAs by APHIS have analyzed in detail the potential for adverse effects on humans from V-RG exposure as a result of ORV experimental programs (USDA 1991, 1992).

4.1.1.1 Potential to Cause Rabies in Humans.

The nature of the recombinant virus used as the V-RG vaccine is such that it cannot cause rabies. This is because the V-RG vaccine only carries the gene for producing the outer coating of the rabies virus (i.e., rabies virus *glycoprotein*) and not those portions of the virus that could result in replication of the rabies virus which would have to happen for the disease to occur. Implementation of ORV programs would reduce the risk of humans contracting rabies by reducing the chance of encountering rabid animals that have been infected by rabid raccoons, gray foxes, or coyotes.

4.1.1.2 Potential for Vaccinia Virus to Cause Disease in Humans.

The vaccinia virus portion of the V-RG vaccine has been recognized as having the potential to cause infections in persons exposed to the vaccine, either through direct contact with the liquid or through contact with the mouth of an animal that has recently ingested the oral vaccine (USDA 1991, p. 39). Because the vaccinia virus used in the V-RG vaccine is the same type of virus that was used in smallpox eradication, although more *attenuated* or weakened, persons who have been immunized against smallpox would likely not experience any adverse reaction to the vaccinia virus, but would likely experience at worst a "booster" in immunity against vaccinia virus. However, the routine administration of smallpox vaccinations was discontinued after smallpox was eradicated. Thus, a large percentage of the population (particularly younger individuals) has not been vaccinated against vaccinia. Vaccinia virus rarely poses much risk of serious health effects -- even when it was *directly applied* (via "scarification" or by scratching the skin) to many hundreds of millions of people during smallpox eradication campaigns, the number that developed vaccinia virus-related illness was only a few per million. In most of those cases the extent of the illness was a mild fever and some lesions or pustules at the site of the injection, followed by full recovery and subsequent immunity to the vaccinia virus (USDA 1991, p. 39; Elvinger 2001). In most people, localized lesions occurred around the site on the arm where the smallpox vaccine was applied, but this a normal and expected response and, in general, no cause for concern.

More severe complications involving the central nervous system (CNS) can occur with vaccinia virus and the nature of these complications is generally thought to be allergic in nature (USDA 1991, p. 39). CNS complications occurred at an average rate of three per million among persons vaccinated with vaccinia virus (e.g., to prevent smallpox) with about 10 to 30 percent of those cases resulting in death (USDA 1991, p. 39). Thus, the chance of a person dying from direct application of a high dose of vaccinia virus via scarification would be about 1 in a million cases or less. With ORV baits distributed in the wild, people would run far less risk of being exposed to vaccinia virus or the V-RG vaccine in a way similar to deliberate smallpox vaccinations, but would primarily only run the risk of skin contact by handling broken baits or coming into contact with the oral regions of pets that had just consumed a bait. For that type of exposure, the chance of adverse effects from human infection with vaccinia virus would be far less than 1 in a million.

Another highly important characteristic of the V-RG vaccine is that it is weaker (more "attenuated") than the original parent vaccinia strain used in making it, and this has been proven in laboratory tests with mice (USDA 1991, p. 18-19). This characteristic even further reduces the risk of V-RG vaccine causing vaccinia-related illness in humans. However, persons with immune system deficiencies (e.g., AIDS) run a relatively greater risk of experiencing adverse effects if directly exposed to the vaccinia virus than would persons with normal immune systems (USDA 1991, p. 40; USDA 1995a; USDA *undated a, undated b*). Experiments in mice suggest that immune-deficient people would be at minimal risk of adverse effects when exposed to V-RG vaccine (Hanlon et al. 1997; USDI 1991, p. 41 and Appendix E therein). To aid in further minimizing the potential for adverse effects on humans because of contact with V-RG vaccine, each ORV bait contains a warning label and telephone number advising persons who make contact with baits or the vaccine liquid to call the number for further guidance.

An indirect source of information on this issue is the safety record of laboratories that have worked with the V-RG vaccine (USDA 1991, p. 27). Ordinarily, lab personnel working with infectious materials or animals are protected by immunization and by procedures and equipment that minimize risk. V-RG vaccine has been completely safe for humans in laboratory situations (USDA 1991, p. 27). Potential nonlaboratory exposure of humans in the various European field trials of V-RG vaccine has been considerable, with no program in place that monitors antibody levels of residents before and after the field trials. However, there have not been any reports of increased incidence of sickness in the field trial areas that could be attributable to the V-RG vaccine (USDA 1991, p. 27; G. Moore, TX Dept. of Health, pers. comm. 2001).

Studies of the effects of V-RG vaccine on nonhuman primates can provide an indication of the potential to affect humans (USDA 1991, p. 27). Studies in which squirrel monkeys (*Saimiri sciureus*) and chimpanzees (*Pan troglodytes*) were inoculated with the V-RG vaccine demonstrated that indirect human exposure to the vaccine that might occur via a bite or from contact with body fluids of a recently vaccinated animal is unlikely to produce adverse effects in healthy individuals (Rupprecht et al. 1992b; USDA 1991, p. 27).

McGuill et al. (1998) conducted a retrospective four-year survey of directors of six ORV programs using V-RG vaccine that were conducted from 1992-1996 to evaluate the potential for human health problems. The programs occurred in Florida , Massachusetts, New Jersey, New York, and Texas. Altogether, they involved a total of 109,276 km^2 (42,181 mi^2) of treated area and a total of nearly six million baits distributed. Human contacts with the baits totaled 316, of which 53 resulted in contact with the actual vaccine liquid. The directors of all programs reported that human contact was minimal and that there were no reported adverse reactions in people exposed to the baits. Human contact with the baits was more likely in areas where bait had white labels vs. lettering in black ink, and the authors speculated the reason to be because the white labeled baits were more visible and, thus, more likely to be noticed. The authors concluded that, based on their survey, major concerns about public health risks from V-RG vaccine were unfounded.

Out of approximately 43.75 million baits disbursed since APHIS-WS program inception in 1995, only 576 people reported contacting or potentially contacting a bait (i.e., picking up bait, finding a bait in yard, or removing bait or sachet from pet's mouth, feces, or vomit - any type of contact with a bait is also defined throughout the document as an "exposure"). This equates to one human exposure per 75,955 baits distributed (0.0013 percent contact cases). In addition, exposure cases were generally insignificant as most involved finding an intact bait. Very few cases involved touching a broken bait, sachet, or liquid vaccine. Furthermore, of the 0.0013% of contact cases reported since APHIS-WS ORV program inception in 1995, only 1 known adverse reaction has occurred (USDA 2003a, 2004c).

The adverse reaction occurred in Ohio in September, 2000, when a woman was bitten by her dog while trying to take away an ORV bait. The vaccine liquid was exposed to the bite area, resulting in localized inflammation and pox virus lesions at the site of the bite, as well as a whole body rash. She further experienced sloughing of the outer layers of skin from some portions of her body, similar to what occurs in the skin condition eczema (C. Rupprecht, CDC, pers. comm. 2001). The woman, who was in her first trimester of pregnancy, is reported to have recovered from complications and gave birth to a 10-lb. baby boy with no apparent adverse health effects (R. Krogwold, OH Dept. of Health, pers. comm. 2001). Most recent reports attribute her response to the vaccinia virus as likely due to the reduced state of immunity typical during pregnancy and an underlying skin disorder (epidermolytic hyperkeratosis) that the woman already had (C. Rupprecht, CDC, pers. comm. 2001). The woman also tested positive for rabies antibodies three weeks after the exposure, indicating she may also have developed rabies immunity (Rupprecht et al. *unpublished* 2001, Rupprecht et al. 2001). A lawsuit was filed in 2001 and a judgment was determined in favor of the defendant, the Ohio Department of Health, in May 2003. This type of incident appears to be unusual, but, nevertheless, points to the need for continued public information and education activities and field surveillance for accidental human exposure to the V-RG virus.

Recent bait exposure information during an ORV project in western Pennsylvania (August-September, 2003) revealed that out of 1,710,399 baits distributed over approximately 25,189 km^2, 190 humans or pets were exposed to a bait. This equates to one exposure per 9,002 baits disbursed or 0.011 percent of distributed baits being found by pets or people. In at least 69 of the 190 potential contact cases, the household pet (dog or cat) found the bait; however, the bait and sachet or sachet alone was normally still intact (at least 91 percent of cases). Of the 6 cases where the sachet was ruptured, no reports were submitted regarding the development of an adverse reaction (i.e., lesions) (USDA 2004c). This ORV project involved hand baiting in several urban areas such as Allegheny County, and aerial baiting of the rural areas. Therefore, pets and other domestic animals were more likely to find the baits and are the primary source for potential and human exposure to ORV baits. Most ORV baiting locations occur over rural or undeveloped lands where human exposure cases can be expected to be much lower.

Although there is no approved anti-viral compound available yet for treatment of suspected vaccinia virus complications, the CDC can make vaccinia immune globulin available to the state on a case-by-case basis, with a requirement that certain specimens (such as acute and convalescent sera and swabs/scabs of the affected site) be collected for diagnosis (C. Rupprecht, CDC, pers. comm. 2001). This option provides some level of additional assurance that severe adverse effects on humans from vaccinia virus reactions would be successfully treated to avoid significant public health problems.

A recent study indicates vaccinia virus that originated from a strain used in smallpox vaccinations in Brazil may have become established in domestic cows in that country (Damaso et al. 2000). This indicates there is some potential for the use of vaccinia virus to result in a new emerging infectious disease. There is currently no evidence that this type of phenomenon has occurred in the U.S. (C. Rupprecht, CDC, pers. comm. 2001). Also, the vaccinia virus strain used for smallpox vaccination in Brazil was different than the strain that is currently used in the V-RG vaccine, and the vaccinia virus portion of V-RG is more attenuated (i.e., *weaker*) than the strains used in smallpox vaccines (USDA 1991, p. 18-19). Thus, it is less likely that V-RG vaccine would result in the establishment and persistence of vaccinia virus in wild or domestic animals. However, no surveillance or testing of animals for this virus has been done in the U.S. to test this hypothesis (C. Rupprecht, CDC, pers. comm. 2001).

The above information shows there is some potential for unusual circumstances to result in short-term adverse health effects from exposure to the vaccinia virus in the V-RG vaccine. However, the overall risk of such effects appears to be low based on the extremely low rate of reported occurrences in ORV programs.

4.1.1.3 Potential to Cause Cancer (Oncogenicity).

This issue has been addressed in a previous EA and in formal risk analyses (USDA 1991, p. 40; USDA *undated a, undated b*). Vaccinia virus is not known to be a tumor-inducing virus. There have been no documented reports of oncogenicity associated with natural vaccinia virus infections in any animal species. The recombinant DNA methods used for preparation of the V-RG vaccine do not introduce any known oncogenes (i.e., cancer-causing genes) into the vaccinia virus strain that could cause it to become tumor-inducing.

Based on this information, risks to humans from contact with the V-RG vaccine are believed to be minimal. The risk and potential severity of adverse effects from rabies exposures in humans would probably be greater without ORV programs than would be the risk of serious adverse effects from vaccinia virus infections with ORV programs.

4.1.2 Potential for Adverse Effects on Target Wildlife Species Populations.

4.1.2.1 Effects of the ORV V-RG Vaccine on Raccoons, Gray Foxes, and Coyotes.

The primary concern here is whether the V-RG virus might cause disease in target animals that consume the ORV baits. Large numbers of raccoons have been inoculated with or have consumed baits containing the vaccine without ill effects, and most were successfully immunized against rabies (USDA 1991, p. 25; Rupprecht et al.1986). Tests showed that the V-RG virus did not invade the CNS or the cerebrospinal fluid of treated raccoons which indicated no adverse effects on the CNS are likely (USDA 1991, p. 25; Hanlon et al. 1989b). Other tests showed that the V-RG vaccine did not cause any lesions or viremia (i.e., presence of the virus in the blood) in tissues sampled from treated raccoons (Rupprecht et al. 1988). These studies, in addition to the absence of reports of adverse effects in free-ranging wildlife in current/historical ORV program areas, have demonstrated the safety and effectiveness of the V-RG vaccine in raccoons. ORV baits containing the V-RG vaccine would thus have no adverse impact on raccoon populations.

Artois et al. (1990) evaluated the safety of V-RG oral vaccine in coyotes and found no evidence of vaccinia virus infections or other complications. Rupprecht et al. (1992a) reported no adverse effects in gray foxes tested. Also, extensive experimental field testing of V-RG vaccine with subsequent collections and necropsies of gray foxes and coyotes for monitoring purposes in Texas have not produced any observed pathological signs of disease or other adverse effects on this species (E. Oertli, TX Dept. of Health, pers. comm. 2001). Extensive laboratory and field testing of V-RG vaccine in many nontarget species, including other closely related members of the Canid (dog) family (Rupprecht et al. 1992a), indicates virtually no risk of oral baits containing V-RG adversely affecting gray fox or coyote populations.

To fulfill requirements for the USDA when using an experimental product, the Texas Department of Health recently prepared the 2002 Texas Gray Fox After Action Report (2003). The report summarized ORV efficacy and safety following its use in the gray fox rabies control program. The Texas Department of Health concluded that of the 1,950,000 dog food based ORV baits distributed in west-central Texas in 2002, none of the 88 target species captured within the vaccination zones demonstrated lesions attributable to the vaccine. In addition, of the 88 gray foxes collected by the Texas Department of Health, 46 (52%) contained levels of neutralizing rabies antibodies. Rabies surveillance data (n = 823 submissions) collected from counties outside the vaccination zone have not detected any animals infected with the gray fox strain of rabies. Therefore, as part of a rabies control program, this vaccine has prevented the further spread of the gray fox strain of rabies into uninfected parts of Texas. The report concluded that RABORAL V-RG® is a safe and efficacious vaccine for use in gray foxes and supports the continued use of ORV by the Texas Department of Health to control rabies in gray foxes. The report will be submitted to the USDA towards full licensure of ORV for use in gray foxes.

4.1.2.2 Effects of Monitoring/Surveillance or Localized Population Reduction (Contingency Actions) on Raccoon Populations in Eastern States.

The estimated cumulative size (over all involved states) of the proposed raccoon rabies ORV barrier zones to be treated with ORV baits purchased with USDA funds in any one year would be about 102,650 km^2 (or about 39,623 mi^2) (Kemere et al. 2001). Raccoon densities range from 0.9 to as high as 250 per km^2. (about 2 to 650 per mi^2.) with most reported densities in the range of about 4 to 30 per km^2. (about 10 to 80 per mi^2.) in rural areas (Riley et al. 1998). Assuming this range of densities occurs in the proposed ORV zones, it is reasonable to assume that overall raccoon numbers in those areas total between 400,000 and 3.1 million.

Raccoon populations can generally be expected to withstand harvest rates of about 49 percent or more annually (Sanderson 1987, USDA 1997j). APHIS-WS and cooperating state or local agencies expect to continue to live-trap or lethally remove less than one percent of the lowest estimated number of raccoons in all states combined for monitoring and surveillance purposes or implementation of localized contingency plans involving lethal population reduction. The 2003 Monitoring Report (USDA 2004c) for the APHIS-WS EA - Oral Vaccination to Control Specific Rabies Virus Variants in Raccoons, Gray Foxes, and Coyotes in the U.S. (2003a) indicates the lowest estimated size of the raccoon population totaled from those states participating in the ORV program is 511,629 raccoons. The APHIS-WS program killed 595 raccoons for enhanced rabies surveillance as a part of cooperative ORV efforts or 0.12 percent of the total lowest estimated population in 2003. The report summarizes that the ORV program continues to have no adverse impacts to raccoon densities and that, in the absence of the ORV program, it is highly likely that far more raccoons would die from rabies than are killed for surveillance and monitoring purposes to critically evaluate the integrity of ORV campaigns.

The majority of raccoons captured for monitoring or surveillance purposes would be released at their site of live capture once they have fully recovered from anesthesia. Individual raccoons may be lethally removed and tested for rabies if they were demonstrating strange behavior symptomatic of the rabies virus or were injured. An exception may be when the animals were captured and drugged for handling purposes close to or during hunting/trapping seasons, at which times they may be euthanized to avoid concerns about hunters or trappers consuming raccoons that contain drug residues (see Section 2.2.1). Contingency actions would be considered that could result in lethal raccoon population suppression in small areas to attempt to contain an outbreak that could occur beyond an existing ORV zone. Given that hunter and trapper harvest and other sources of mortality would occur, there are no anticipated significant cumulative impacts to raccoon populations even if contingency actions would be infrequently conducted in small areas of the states involved in ORV programs.

4.1.2.3 Effects of Monitoring/Surveillance or Localized Population Reduction (Contingency Actions) on Gray Fox Populations in Texas.

The APHIS-WS program in Texas has analyzed the impacts of program activities on gray fox populations including activities that involve assistance with rabies monitoring and surveillance in several previous EAs. Those EAs covered such activities in the area of the state affected by the ORV program as well as the entire state, and include analysis of the effects of all lethal removal of gray foxes by APHIS-WS. The analyses in, and subsequent monitoring reviews of, the EAs showed that APHIS-WS total gray fox take combined with other known take (e.g., annual trapper and hunter harvest), has been far below any level that would begin to adversely impact overall populations of gray fox (USDA 1997a, 1997b, 1997c, 1997d, 1997e, 1997f, 1997g, 1997h, and 1997i). Thus, the cumulative impact on gray fox populations in Texas would be insignificant.

These EA monitoring reports state that gray fox populations can generally be expected to withstand annual harvest rates of about 25 percent or more (USDA 2004b). The 2003 Monitoring Report (USDA 2004c) for the APHIS-WS EA – Oral Vaccination to Control Specific Rabies Virus Variants in Raccoons, Gray Foxes, and Coyotes in the U.S. (2003a) indicates the number of gray foxes removed by the APHIS-WS ORV program alone equated to 0.03 percent of the estimated population. In 2003, lethal removal (private harvest rates combined with APHIS-WS damage management activities) totaled 1.6 percent for gray foxes, far below the sustainable harvest level (USDA 2004b). Combining APHIS-WS lethal removal during the ORV program with the aforementioned take, cumulative lethal removal equates to 1.7 percent for the gray fox population (USDA 2004c). Therefore, cumulative impacts (monitoring and surveillance, localized population reduction, annual trapper and hunter harvest, other mortality) to gray fox populations have been and would continue to be negligible.

4.1.2.4 Effects of Monitoring/Surveillance or Localized Population Reduction (Contingency Actions) on Coyote Populations in Texas.

Impacts on coyote populations from APHIS-WS depredation management and rabies monitoring activities in south Texas were also analyzed in prior EAs. Those EAs covered such activities in the area of the state affected by the coyote rabies ORV program and include analysis of the effects of all lethal removal of coyotes in those areas by APHIS-WS. Those analyses show that APHIS-WS' take in combination with other known harvest has been less than 15 percent of the estimated population in any one year which is far below the 70 percent harvest level that can be sustained by coyotes (USDA 1997g, 1997i). Thus, the cumulative impact on coyote populations in south Texas would be insignificant.

The 2003 Monitoring Report (USDA 2004c) for the APHIS-WS EA – Oral Vaccination to Control Specific Rabies Virus Variants in Raccoons, Gray Foxes, and Coyotes in the U.S. (2003a) indicates the number of coyotes removed by the APHIS-WS ORV program alone equates to 0.0014 percent of the estimated population. In 2003, lethal removal (private harvest rates combined with APHIS-WS damage management activities) totaled 9.8 percent for coyotes, far below the sustainable harvest level (USDA 2004b).

Combining APHIS-WS lethal removal during the ORV program with the aforementioned take, cumulative lethal removal equates to 9.9 percent for the coyote population (USDA 2004c). Therefore, cumulative impacts (monitoring and surveillance, localized population reduction, annual trapper and hunter harvest, other mortality) to coyote populations have been and would continue to be negligible.

4.1.3 Potential for Adverse Effects on Nontarget Wildlife Species, including Threatened or Endangered Species.

4.1.3.1 Effects of the RABORAL V-RG® Vaccine on Nontarget Wildlife including Threatened or Endangered Species.

The primary concern here is whether the vaccinia virus-rabies glycoprotein combination (i.e., RABORAL V-RG® vaccine) might cause disease in nontarget animals that consume or otherwise come into contact with the vaccine in baits. Rupprecht et al. (1992a) and Pastoret et al. (1995) summarized the results of V-RG safety trials in nontarget species. More than 50 species from Europe and North America have been tested and include relevant taxonomic groups believed to be potentially at risk for contact with the V-RG vaccine such as:

- Natural ecological competitors of raccoons and foxes, such as the opossum (*Dedelphis virginianus*), several mustelids [skunk, badger, mink (*Mustela vision*), otter (*Lutra canadensis*), ferret (*Mustela putorius)*], other members of the Canid family [coyote, red fox, gray fox, arctic fox (*Alopex lagopus*), raccoon dog (*Nyctereutes procyonoides*)], bobcat (*Lynx rufus*). and American black bear (*Ursus americanus*).

- Domestic cats (*Felix domesticus*) and dogs (*Canis familiaris*).

- 19 rodent species (Order *Rodentia*) that might be expected to gnaw on or consume baits. Families within this order represented in the studies included: *Muridae, Erethizonidae* [porcupine (*Erithizon dorsatum*)], *Sciuridae, Cricetidae,* and *Zapodidae*.

- 1 bat species [Daubenton's bat (*Myotis daubentoni*)].

- 8 bird species, including three hawk species [red-tailed hawk (*Buteo jamaicensis*), kestrel (*Falco tinnunculus*), common buzzard (*Buteo Buteo*)], and one species each of owl [great horned owl (*Bubo virginianus*)], crow [carrion crow (*Corvus corone*)], gull [ring-billed gull (*Larus delawarensis*)], magpie (*Pica pica*), and jay (*Garrulus glandarius*).

- Domestic livestock [cattle (*Bos taurus*), sheep (*Ovis ovis*)].

- Two wild ungulate species [wild boar (*Sus scrofa*), white-tailed deer (*Odocoileus virginianus*)].

- Two primate species (squirrel monkey and chimpanzee).

Rupprecht et al. (1992a) reported there has been no mortality or morbidity (i.e., signs or symptoms of disease) and no lesions typical of pox virus infections caused by V-RG vaccine in over 350 individual animals representing some 20 taxonomic families of animals. They concluded that the extensive laboratory safety experiments showed V-RG to be safe in all species tested to date. In field trials with V-RG ORV baits to treat wild raccoons in which target and nontarget species were captured and tested, no vaccine-related lesions or other adverse effects have been found to occur (Rupprecht et al. 1992a). The ORV program may, instead, actually reduce the likelihood of wildlife being exposed to the rabies virus. The Texas Department of Health (2003) concluded in their 2002 Texas Gray Fox After Action Report that none of the 47 nontarget species [23 coyotes, 12 skunks (*Mephitis mephitis* and *Spilogale putorius*), 8 raccoons, 3 bobcats (*Felis rufus*), and 1 red fox (*Vulpes vulpes*)], captured within the vaccination zones exhibited lesions attributable to the vaccine. Other nontargets observed during monitoring and surveillance activities within the vaccination zone had no indication of adverse reactions to the ORV baits.

There is no evidence of potential harm to target or nontarget species from overdosage of RABORAL V-RG® vaccine by any route or from multiple doses. A number of nontarget species have been dosed with 2 to 10 times the amount of vaccine in an individual ORV bait without adverse effects (USDA 1991, p. 47; Rupprecht et al. 1992a). Therefore, even if domestic animals received multiple doses of vaccine by consuming multiple baits, no adverse effects would be expected to occur.

The RABORAL V-RG® vaccine would not adversely affect any non-warm blooded animal species. The vaccinia virus and other orthopoxviruses do not replicate or reproduce themselves in non-warm blooded species (Rupprecht, CDC, pers. comm. 2002). Therefore, ORV is not expected to cause any adverse effects on fish, reptiles, amphibians, or any invertebrate species should any members of these species groups consume or otherwise be exposed to the vaccine.

The RABORAL V-RG® vaccine distributed in baits would have no adverse effects on any state or federally listed threatened or endangered species or their critical habitats (see Appendices C and D for species lists). Few listed species would be likely to be attracted to the ORV baits, and the few carnivore species that might consume baits would be expected to experience no effect other than possibly becoming immunized against rabies.

4.1.3.2 Effects of Capture/Removal Methods (Used in Monitoring and Surveillance or to Reduce Local Populations of Target Species under State Contingency Plans) on Nontarget Species, including Threatened or Endangered species.

The methods proposed for use in raccoon rabies monitoring and surveillance areas or in implementing localized population reduction under state contingency actions would have no significant adverse effects on nontarget species. Nontarget animals captured in cage traps would normally be released unharmed unless lethal removal was requested by the cooperating landowner or if the animal appeared injured or sick. Therefore, monitoring and surveillance should have no effect on nontarget species populations.

The 2003 Monitoring Report (USDA 2004c) for the APHIS-WS EA – Oral Vaccination to Control Specific Rabies Virus Variants in Raccoons, Gray Foxes, and Coyotes in the U.S. (2003a) indicates that nontarget populations were not adversely affected by APHIS-WS actions in 2003. Occasionally, nontarget wildlife species were captured during ORV monitoring and surveillance efforts. A total of 1,950 nontargets were captured during the 2003 ORV program (USDA 2004c). Most species were captured in cage traps and released unharmed (1,782 total in 2003). Some nontarget animals were lethally removed (168 total in 2003), mainly if they were demonstrating strange behavior consistent with symptoms of rabies, were injured, were killed intentionally to address damage reported by the cooperating landowners at their request, or were euthanized for rabies testing. The nontargets killed intentionally (86 opossums, 37 striped skunks, 17 raccoons, 14 woodchucks, 3 domestic cats, 3 gray foxes, 2 red squirrels, 1 fox squirrel, 1 eastern cottontail, 1 bobcat, and 1 ringtail) were not considered to be from low density populations and removal was not expected to have any cumulative adverse effects on populations in the area (USDA 2004a, 2004c).

No T&E species have been adversely affected by APHIS-WS actions during the course of the ORV program. In 2001, one state-endangered river otter (*Lutra canadensis*) was incidentally captured in a cage trap during Ohio ORV surveillance activities, but was released unharmed in accordance with the direction of the Ohio Division of Wildlife. APHIS-WS concluded in the monitoring report (USDA 2004d) that the cumulative impact on nontarget species is negligible and that APHIS-WS has not adversely affected the viability of any wildlife species populations. One American alligator (*Alligator mississippiensis*) was incidentally captured in Florida during the 2003 ORV program; however, it was released unharmed. The American alligator is federally listed as threatened due to similarity of appearance [50 CFR 17.42(a)] and state-listed as a species of concern in Florida. The federal designation regulates commercial sale and trade of alligator skins and other products. Because the animal was released unharmed, APHIS-WS did not violate the "similarity of appearance" designation. Again, APHIS-WS stated in the monitoring report (USDA 2004c) that the determination of no adverse affect is still valid for the proposed action. The report concluded that the cumulative impact on nontarget species is negligible and that APHIS-WS had not adversely affected the viability of any wildlife species populations.

Some of the methods proposed for use in collecting target species in ORV areas have the potential for accidentally catching or killing nontarget animals (i.e., leghold traps or snares). Methods such as ground-based and aerial shooting would have no effect on nontarget species because they are essentially 100 percent selective for target species. APHIS-WS has analyzed the effects on nontarget species by such methods in nine previous EAs which found no significant adverse effects on populations (USDA 1997a, 1997b, 1997c, 1997d, 1997e, 1997f, 1997g, 1997h, and 1997i).

APHIS-WS reviewed lists of federal and state T& E species (Appendices C and D) and USDA-Forest Service Regional Forester Sensitive Animals (Regions 8 and 9) to determine if any species might be affected. ORV programs or the methods used in capture/removal of target species in monitoring activities or contingency plan implementation would have no effect on any listed bird, reptile, amphibian, fish, invertebrate, or plant species. The only species on the federal or state T&E or special status lists that might be expected to raise concerns about potential effects from the proposed action are:

Federally Listed T&E Species (USDI 2004):

- **Canada Lynx** (*Lynx canadensis*). This species is federally designated as threatened in Maine. The USFWS has documentation that lynx occur and are reproducing in Maine and, therefore, believes that lynx could possibly disperse to contiguous suitable habitat in New Hampshire, but consider lynx occurrence as rare in New Hampshire based on recent records (USDI 2000). Furthermore, the USFWS considers it possible that lynx have been extirpated from New Hampshire, Vermont and New York (USDI 2000). The USFWS has concluded that, in the Northeast, a population of lynx most likely continues to exist in the core region of western Maine, northern New Hampshire, southeastern Quebec, and western New Brunswick; however, the range appears to have retracted northward (USDI 2000). Based on a review of past capture records, APHIS-WS has determined there to be no risk to lynx from ORV programs, from rabies monitoring or surveillance (including the capture and testing of raccoons) or other current APHIS-WS activities in these states (USDA 2000). Also, lynx are not expected to be attracted to or to consume ORV baits and would thus not be affected by them. Therefore, APHIS-WS has determined that the proposed action would have no effect on this species. A potential beneficial indirect impact of ORV programs on lynx conservation would be a reduced risk of contracting and dying of rabies if the spread of raccoon rabies is successfully halted or if the variant strain is eliminated.

- **Eastern Puma** (*Puma concolor couguar*). This species is federally designated as endangered in its entire historical range (Connecticut, District of Columbia, Delaware, Illinois, Indiana, Kentucky, Massachusetts, Maryland, Maine, Michigan, North Carolina, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Virginia, Vermont, and West Virginia). The Eastern puma was presumed extinct in wild; however, some sightings have been reported in Minnesota and Michigan recently. These individuals are believed to have originated from around New Brunswick or Manitoba, Canada (per http://endangered.fws.gov/). In addition, a number of sightings have been reported in the Southeast Region, but the best evidence for a small permanent population has come from the Great Smoky Mountain National Park Region. Sightings have also been reported in three other North Carolina areas including the Nantahala National Forest, the northern portion of the Uwharrie National Forest, and the State's southeastern counties. The remaining population of this species is extremely small and exact numbers are unknown. This species is not expected to be attracted to or to consume ORV baits. Also, animals the size of cougars would not be affected by cage-traps used to collect raccoons for monitoring purposes. Therefore, ORV programs, including monitoring activities involving the live-capture or lethal removal of raccoons, would have no effect on this species. A potential beneficial indirect impact of ORV programs on this species would be a reduced risk of contracting and dying of rabies if the spread of raccoon rabies is successfully halted or if the variant strain is eliminated.

- **Florida Panther** (*Puma concolor coryi*). This subspecies of cougar occurs in Florida and is federally designated as endangered. Florida panthers are not expected to be attracted to or consume ORV baits and would thus not be affected by them. Also, animals the size of cougars would not be affected by cage-traps used to capture raccoons for monitoring purposes. Therefore, ORV programs, including monitoring activities involving the live-capture or lethal removal of raccoons, would have no effect on this species. A potential beneficial indirect impact of ORV programs on this species would be a reduced risk of contracting and dying of rabies if the spread of raccoon rabies is successfully halted or if the variant strain is eliminated.

- **Ocelot** (*Leopardus pardalis*) and **Gulf Coast Jaguarundi** (*Herpailurus yagouaroundi cacomitli*). These two species are federally classified as endangered and potentially occur in south Texas where coyote rabies ORV programs are conducted. The USFWS provided APHIS-WS an opinion that ORV programs in south Texas are not likely to adversely affect these species (letter dated January 18, 1995, copy contained in USDA 1995b). Methods that would be used to collect coyotes for monitoring purposes that might have the potential to affect these species include leghold traps and snares. APHIS-WS has agreed to certain program restrictions on the use of these methods in areas where ocelot and jaguarundis might occur in order to avoid incidental take or jeopardy to these species, and the USFWS has issued a Biological Opinion (BO) and incidental take statement concurring that incidental take is unlikely to occur (USDI 1997). The USFWS also recognized that a potential beneficial indirect impact of ORV programs on this species would be a reduced risk of contracting and dying of rabies if the spread of coyote rabies is successfully halted or if the variant strain is eliminated.

- **Jaguar** (*Panthera onca*). This species is federally designated as endangered in Texas. Although the jaguar's historical range includes south Texas, the latest record of occurrence was in 1948 (Nowak 1975). The general consensus indicates that habitat fragmentation and loss north and south of the Mexican border makes recurrence in TX unlikely (62 FR 39147, July 22, 1997). For these reasons, APHIS-WS determined its activities, including the use of methods proposed for collecting coyotes for monitoring purposes in ORV programs, will have no effect on the jaguar in TX. The USFWS issued a BO on the effects of the APHIS-WS program on the jaguar in 1999 in which the Service determined activities by APHIS-WS were not likely to jeopardize the continued existence of this species (USDI 1999). The BO contained an incidental take statement with reasonable and prudent measures and terms and conditions that APHIS-WS follows to minimize the risk of incidental take (USDI 1999).

- **Gray wolf** (*Canis lupus*).

  - **Mexican Gray Wolf.** The Mexican gray wolf is federally designated as endangered in Texas. The historical range of the Mexican gray wolf includes south Texas where the coyote rabies ORV programs have been and would continue to be conducted. No Mexican wolves are currently known or believed to exist in Texas. Therefore, ORV bait distribution would have no effect on this species. ORV programs would not adversely affect the species, should the wolf once again become established in Texas. In 1988, he USFWS issued a BO (for naturally occurring wolves) and Conference Opinion (on an experimental nonessential population being estaolished in Arizona and New Mexico) on the effects of the APHIS-WS program on the Mexican wolf. In that BO, the USFWS determined activities by APHIS-WS were not likely to jeopardize the continued existence of this species (USDI 1998). The BO contains an incidental take statement that requires reini iation of consultation if a wolf is taken (USDI 1998). Should this species be reintroduced in Texas, a potential beneficial indirect impact of ORV programs would be a reduced risk of contracting and dying of rabies if the spread of coyote and gray fox rabies is successfully halted or if the variant strain is eliminated.

  - **Eastern Distinct Population Segment (DPS) of the Gray Wolf.** On April 1, 2003, this segment of the gray wolf population was reclassified as federally threatened (previously considered endangered under the ESA). The eastern gray wolf DPS encompasses the historical range of the gray wolf from the Great Plains to the Atlantic Coast. Due to successful gray wolf recovery in Minnesota, Wisconsin, and Michigan, this DPS is now classified as Threatened. Animals the size of wolves would not be affected by cage traps used to capture raccoons for monitoring purposes. The small size of the cage traps, trap placement, bait type, and prebaiting techniques used for monitoring and surveillance activities should preclude the capture of these species. A potential beneficial indirect impact of ORV programs would be a reduced risk of contracting and dying of rabies if the spread of raccoon, coyote, and gray fox rabies is successfully halted or if the raccoon variant strain is eliminated.

- **Red Wolf** (*Canis rufus*). The historic range of the red wolf occurred throughout the southeastern U.S. from the Atlantic Coast to central Texas and from the Gulf of Mexico to central Missouri. Red wolves are federally listed as endangered in Florida, North Carolina and South Carolina. However, red wolves are now considered to be extinct in the wild except for experimental populations in Tennessee and North Carolina. Currently 16 wolves are located in the Great Smokey Mountains National Park in Tennessee. No red wolves are currently known or believed to exist outside this park. Therefore, ORV bait distribution would have no effect on this species.

- **Louisiana Black Bear** (*Ursus americanus luteolus*). This species is listed as federally threatened in Louisiana, Mississippi, and Texas. It is conceivable that this species could consume ORV baits intended for raccoons. Safety studies on black bears (Rupprecht et al. 1992a) indicate bears would not be adversely affected by ORV. An indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. Therefore, the proposed action should have no significant impact on this species.

- **American Black Bear** (*Ursus americanus*). This species is federally listed as threatened due to similarity of appearance (T-S/A) to the Louisiana black bear in Louisiana, Mississippi, and Texas. It is conceivable that this species could consume ORV baits intended for raccoons. Safety studies on black bears (Rupprecht et al. 1992a) indicate bears would not be adversely affected by ORV. If a black bear cub was inadvertently captured in a cage trap set for a raccoon, it would be released unharmed and reported to the appropriate wildlife agencies. Therefore, the proposed action should have no significant impact on this species.

- **Delmarva Fox Squirrel** (*Sciurus niger cinereus*). This species is federally listed as endangered in Delaware, Maryland, and Virginia. It is conceivable that this species could consume ORV baits intended for raccoons. Although not specifically tested for safety in this species, safety studies on other closely related rodent species (Rupprecht et al. 1992a) indicate fox squirrels would not be adversely affected. Also, an indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. If a Delmarva fox squirrel was inadvertently captured in a cage trap set for a raccoon, it would be released unharmed to avoid lethal take and reported to the appropriate wildlife agency. Therefore, the proposed action should have no significant impact on this species.

- **American Alligator** (*Alligator mississippiensis*). This species was delisted in 1987 and reclassified as threatened due to similarity of appearance (T-S/A) to other species such as crocodiles. This federal designation regulates commercial sale and trade of alligator skins and other products. The T-S/A designation was issued for the entire range of the alligator, including Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, and Texas. One alligator was captured in a cage trap in Florida during rabies monitoring and surveillance in 2003. It was released unharmed per the appropriate Florida wildlife agency. Although unlikely, if another alligator is captured in future ORV programs, it would also be released unharmed and reported to the appropriate state wildlife agency. By following these measures, APHIS-WS should avoid any lethal take of and adverse impact to these species.

- **American Crocodile** (*Crocodylus acutus*). This species is federally listed as endangered in Florida. The crocodile would not be attracted to ORV baits; however, although highly unlikely, a crocodile could conceivably be captured in a cage trap set for surveillance and monitoring of target raccoon species. If a crocodile was inadvertently captured in a cage trap, it would be released unharmed to avoid lethal take and reported to the appropriate wildlife agencies. Therefore, the proposed action should have no significant impact on this species.

State Listed Species:

- **Canada Lynx** (*Lynx canadensis*). This species is state-listed as endangered in Michigan, New Hampshire, and Vermont, and threatened in New York. This species was discussed in detail in the Federally Listed T&E Species section.

- **Bobcat** (*Lynx rufus*). The bobcat is state-listed as endangered in Ohio, Indiana, and New Jersey; threatened in Rhode Island; and "in need of conservation" in Maryland. ORV baits distributed for raccoons would not adversely affect this species (Rupprecht et al. 1992a). It is considered highly unlikely that bobcats would be caught in cage traps set for raccoons during monitoring or local population suppression activities. However, if a bobcat is caught unintentionally, it would be released unharmed to avoid lethal take and reported to the appropriate state wildlife agencies. An indirect beneficial effect would be a reduced risk of this species suffering further declines in the state because of a rabies epizootic.

- **Eastern Puma** (*Puma concolor couguar*). This species is state-listed as endangered in Georgia, Michigan, New York, North Carolina, Vermont, and Virginia, and a "species of concern" in Connecticut. This species was discussed in detail in the Federally Listed T&E Species section.

- **Florida Panther** (*Puma concolor coryi*). This species is state-listed as endangered in Florida, Georgia, and Louisiana. This species was discussed in detail in the Federally Listed T&E Species section.

- **Jaguar** (*Panthera onca*). This species is state-listed as endangered in Texas. This species was discussed in detail in the Federally Listed T&E Species section.

- **Ocelot** (*Leopardus pardalis*). This species is state-listed as endangered in Texas. This species was discussed in detail in the Federally Listed T&E Species section.

- **Jaguarundi** (*Herpailurus yagouaroundi cacomitli*). This species is state-listed as endangered in Texas. This species was discussed in detail in the Federally Listed T&E Species section.

- **White-nosed Coati** (*Nasua narica*). This species is state-listed as threatened in Texas. It is conceivable this omnivorous species would be attracted to and consume ORV baits. Although not specifically tested for safety in this species, safety studies on other closely related species such as raccoons (Rupprecht et al. 1992a) indicate coatis would not be adversely affected if they were to consume ORV baits. Also, an indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. Therefore, the proposed action should have no significant impact on this species.

- **Black-footed Ferret** (*Mustela nigripes*). This species is state-listed as endangered in Texas; however, the last records of black-footed ferrets in Texas were from Dallam County in 1953 and Bailey County in 1963. Thus, this animal has been considered extirpated from Texas. Therefore, APHIS-WS has determined that the proposed action would have no effect on this species in Texas. A potential beneficial indirect impact of ORV programs on margay conservation would be a reduced risk of contracting and dying of rabies if the spread of raccoon rabies is successfully halted or if the variant strain is eliminated.

- **Margay** (*Leopardus weidi*). This species is state-listed as threatened in Texas. The margay is a neotropical felid that ranges from northern Mexico to northern Argentina. It has not been recorded in Texas since a specimen was taken near Eagle Pass in the 1850s. It is extremely unlikely this species would wander into portions of Texas where the ORV program is occurring. Therefore, APHIS-WS has determined that the proposed action would have no effect on this species. A potential beneficial indirect impact of ORV programs on margay conservation would be a reduced risk of contracting and dying of rabies if the spread of raccoon rabies is successfully halted or if the variant strain is eliminated.

- **Gray Wolf** (*Canis lupus*). This species is state-listed as endangered in New York, Texas, and Virginia, threatened in Michigan, and a "species of concern" in Connecticut. This species was discussed in detail in the Federally Listed T&E Species section.

- **Red Wolf** (*Canis rufus*). This species is state-listed as endangered in Louisiana and Texas. This species was discussed in detail in the Federally Listed T&E Species section.

- **American Black Bear** (*Ursus americanus*). This species is state-listed as endangered in Ohio, threatened in Texas, and as a "species of concern" in Kentucky and South Carolina. This species was discussed in detail in the Federally Listed T&E Species section.

- **Louisiana Black Bear** (*Ursus americanus luteolus*). This species is state-listed as threatened in Louisiana and Texas. This species was discussed in detail in the Federally Listed T&E Species section.

- **Florida Black Bear** (*Ursus americanus floridanus*). This species is state-listed as threatened in Florida. It is conceivable that this species could consume ORV baits intended for raccoons. Safety studies on black bears (Rupprecht et al. 1992a) indicate bears would not be adversely affected if they were to consume ORV baits. An indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. If a black bear was inadvertently captured in a cage trap set for a raccoon, it would be released unharmed to avoid lethal take and reported to the appropriate wildlife agency. Therefore, the proposed action should have no significant impact on this species.

- **Delmarva Fox Squirrel** (*Sciurus niger cinereus*), **Sherman's Fox Squirrel** (*Sciurus niger shermani*), **Big Cypress Fox Squirrel** (*Sciurus niger avicennia*), and Eastern Fox Squirrel (*Sciurus niger*). The Delmarva fox squirrel is state-listed as endangered in Pennsylvania, Maryland, Virginia, and Delaware. The Sherman's fox squirrel is state-listed as a "species of concern" in Florida. The Big Cypress fox squirrel is state-listed as threatened in Florida. The eastern fox squirrel is state-listed as a "species of concern" in South Carolina. Although not specifically tested for safety in these species, safety studies on other closely related rodent species (Rupprecht et al. 1992a) indicate fox squirrels would not be adversely affected if they were to consume ORV baits. Also, an indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. If a fox squirrel was inadvertently captured in a cage trap set for a raccoon, it would be released unharmed to avoid lethal take and reported to the appropriate wildlife agency. Therefore, the proposed action should have no significant impact on this species.

- **Virginia Northern Flying Squirrel** (*Glaucomys sabrinus fuscus*), **West Virginia Northern Flying Squirrel** (*Glaucomys sabrinus fuscus*), and **Carolina Northern Flying Squirrel** (*Glaucomys sabrinus coloratus*). The Virginia northern flying squirrel is state-listed as endangered in Virginia. The West Virginia northern flying squirrel is state-listed as a "species of concern" in West Virginia. The Carolina northern flying squirrel is state-listed as endangered in Tennessee and North Carolina. Although not specifically tested for safety in this species, safety studies on other closely related rodent species (Rupprecht et al. 1992a) indicate flying squirrels would not be adversely affected if they were to consume ORV baits. Also, an indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. If a flying squirrel was inadvertently captured in a cage trap set for a raccoon, it would be released unharmed to avoid lethal take and reported to the appropriate state wildlife. Therefore, the proposed action should have no significant impact on this species.

- **North American Porcupine** (*Erethizon dorsatum*). This species is state-listed as "in need of management" in Maryland. Although not specifically tested for safety in this species, safety studies on other closely related rodent species (Rupprecht et al. 1992a) indicate this species would not be adversely affected if they were to consume ORV baits. Also, an indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. If a porcupine was inadvertently captured in a cage trap set for a raccoon, it would be released unharmed to avoid lethal take and reported to the appropriate state agency. Therefore, the proposed action should have no significant impact on this species.

- **American Marten** (*Martus americana*). This species is state-listed as threatened in New Hampshire and endangered in Vermont. It is conceivable that this species could consume ORV baits intended for raccoons. Although not specifically tested for safety in this species, safety studies on other closely related Mustelid species (e.g., skunk, mink, badger, ferret, and otter) (Rupprecht et al. 1992a) indicate martens would not be adversely affected if they were to consume ORV baits. Also, an indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. If a pine marten was inadvertently captured in a cage trap set for a raccoon, it would be released unharmed to avoid lethal take and reported to the appropriate state agency to complement their population monitoring data for this state-listed species. Therefore, the proposed action should have no significant impact on this species.

- **Everglades Mink** (*Mustela vison evergladensis*). This species is state-listed as threatened in Florida. It is conceivable that this species could consume ORV baits intended for raccoons; however, populations of this species inhabit the Everglades in southern Florida and ORV program activities are not proposed for that portion of the state. Safety studies on Mustelid species (Rupprecht et al. 1992a) indicate the mink would not be adversely affected if they were to consume ORV baits. Also, an indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. If a least weasel was inadvertently captured in a cage trap set for a raccoon, it would be released unharmed to avoid lethal take and reported to the appropriate state agency. Therefore, the proposed action should have no significant impact on this species.

- **Least Weasel** (*Mustela nivalis*). This species is state-listed as a "species of concern" in Kentucky and Indiana and "in need of management" in Maryland. It is conceivable that this species could consume ORV baits intended for raccoons. Although not specifically tested for safety in this species, safety studies on other closely related Mustelid species (e.g., skunk, mink, badger, ferret, and otter) (Rupprecht et al. 1992a) indicate weasels would not be adversely affected if they were to consume ORV baits. Also, an indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. If a least weasel was inadvertently captured in a cage trap set for a raccoon, it would be released unharmed to avoid lethal take and reported to the appropriate state agency to complement their population monitoring data for this state listed species. Therefore, the proposed action should have no significant impact on this species.

- **Long-tailed Weasel** (*Mustela frenata*). This species is state-listed as "nongame species regulation" in Alabama. It is conceivable that this species could consume ORV baits intended for raccoons. Although not specifically tested for safety in this species, safety studies on other closely related Mustelid species (e.g., skunk, mink, badger, ferret, and otter) (Rupprecht et al. 1992a) indicate weasels would not be adversely affected if they were to consume ORV baits. Also, an indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. If a long-tailed weasel was inadvertently captured in a cage trap set for a raccoon, it would be released unharmed to avoid lethal take and reported to the appropriate state agency to complement their population monitoring data for this state listed species. Therefore, the proposed action should have no significant impact on this species.

- **American Badger** (*Taxidea taxus*). This species is state-listed as a "species of concern" in Ohio and Indiana. It is conceivable that this species could consume ORV baits intended for raccoons. Safety studies on badgers and other mustelids (Rupprecht et al. 1992a) indicate this species would not be adversely affected if they were to consume ORV baits. An indirect beneficial effect of ORV would be a reduced risk of the species suffering further declines because of a rabies epizootic. If an American badger was inadvertently captured in a cage trap set for a raccoon, it would be released unharmed to avoid lethal take and reported to the appropriate state agency. Therefore, the proposed action should have no significant impact on this species.

- **Ermine** (*Mustela erminea*). This species is state-listed as a "species of concern" in Ohio. Although not specifically tested for safety in this species, safety studies on other closely related Mustelid species (e.g., skunk, mink, badger, ferret, and otter) (Rupprecht et al. 1992a) indicate ermines would not be adversely affected if they were to consume ORV baits. An indirect beneficial effect of ORV would be a reduced risk of the species suffering further declines because of a rabies epizootic. If an ermine was inadvertently captured in a cage trap set for a raccoon, it would be released unharmed to avoid lethal take and reported to the appropriate state agency. Therefore, the proposed action should have no significant impact on this species.

- **Round-tailed Muskrat** (*Neofiber alleni*). This species is state-listed as threatened in Georgia. It is conceivable that this species could consume ORV baits intended for raccoons. Although not specifically tested for safety in this species, safety studies on other closely related rodents (Rupprecht et al. 1992a) indicate muskrats would not be adversely affected if they were to consume ORV baits. An indirect beneficial effect of ORV would be a reduced risk of the species suffering further declines because of a rabies epizootic. If a round-tailed muskrat was inadvertently captured in a cage trap set for a raccoon, it would be released unharmed to avoid lethal take and reported to the appropriate state agency. Therefore, the proposed action should have no significant impact on this species.

- **Eastern Spotted Skunk** (*Spilogale putorius*). This species is state-listed as a "species of concern" in Kentucky, South Carolina, and West Virginia. It is conceivable that this species could consume ORV baits intended for raccoons. Safety studies on skunks (Rupprecht et al. 1992a) indicate this species would not be adversely affected if they were to consume ORV baits. Also, an indirect beneficial effect would be a reduced risk of the species suffering further declines because of a rabies epizootic. If a spotted skunk was inadvertently captured in a cage trap set for a raccoon, it would be released unharmed to avoid lethal take and reported to the appropriate state agency. Therefore, the proposed action should have no significant impact on this species.

- **Northern River Otter** (*Lutra canadensis*). The river otter is state-listed as endangered in Indiana and a "species of concern" in Virginia. ORV baits distributed for raccoons would not adversely affect this species (Rupprecht et al. 1992a). It is considered highly unlikely that river otters would be caught in cage traps set for raccoons during monitoring or local population suppression activities, although one river otter was captured and released unharmed in FY 2001. The APHIS-WS program in Ohio has a scientific collecting permit from the Ohio Department of Natural Resources, Division of Wildlife (ODOW). The ODOW has advised APHIS-WS to release any nontargets captured. If any other captures occurred they would also be released unharmed and reported to the appropriate state wildlife agency. By following these measures, APHIS-WS should avoid any lethal take of river otters. An indirect beneficial effect would be a reduced risk of this species suffering further declines in the state because of a rabies epizootic.

- **Snowshoe Hare** (*Lepus americanus*). This species is state-listed as endangered in Virginia and Ohio. The snowshoe hare has recently been reintroduced into Ohio (A. Montoney, APHIS-WS, pers. comm. 2001). Hares would not likely be attracted to or consume ORV baits. Therefore, ORV should have no effect on this species. It is highly unlikely that any snowshoe hares would be captured incidentally during rabies monitoring or local raccoon population suppression activities. If any captures occurred they would be released unharmed and reported to the appropriate wildlife agency. By following these measures, APHIS-WS should avoid any lethal take of this species. Also, an indirect beneficial effect would be a reduced risk of this species suffering further declines in the state because of a rabies epizootic.

- **New England Cottontail** (*Sylvilagus transitionalis*). This species is state-listed as "in need of conservation" in Maryland and a "species of concern" in New York, South Carolina, and Vermont. Although unlikely, a rabbit could conceivably be captured in a cage trap set for raccoons. Any New England cottontails caught would be released unharmed and reported to the appropriate wildlife agency, which would avoid any significant impacts on the species. Also, an indirect beneficial effect would be a reduced risk of the species contracting and dying of rabies.

- **Appalachian Cottontail** (*Sylvilagus obscurus*). This species is state-listed as a "species of concern" in West Virginia. Cottontails would not likely be attracted to or consume ORV baits. Therefore, ORV should have no effect on this species. Although unlikely, this species could conceivably be captured in a cage trap set for raccoons. Any Appalachian cottontails caught would be released unharmed and reported to the appropriate wildlife agency. By following these measures, APHIS-WS should avoid any lethal take of this species. Also, an indirect beneficial effect would be a reduced risk of this species suffering further declines in the state because of a rabies epizootic.

- **Marsh Rabbit** (*Sylvialagus palustris*) and **Lower Keys Marsh Rabbit** (*Sylvilagus palustris hefneri*). The marsh rabbit is state-listed as a "species of concern" in Virginia. The Lower Keys marsh rabbit is state-listed as endangered in Florida. Rabbits would not likely be attracted to or consume ORV baits. Therefore, ORV should have no effect on this species. Although unlikely, a rabbit could conceivably be captured in a cage trap set for raccoons. Any marsh rabbits caught would be released unharmed and reported to the appropriate wildlife agency, which would avoid any significant impacts on the species. Also, an indirect beneficial effect would be a reduced risk of the species contracting and dying of rabies.

- **Swamp Rabbit** (*Sylvilagus aquaticus*). The swamp rabbit is state-listed as a "species of concern" in South Carolina. Rabbits would not likely be attracted to or consume ORV baits. Therefore, ORV should have no effect on this species. Although unlikely, a rabbit could conceivably be captured in a cage trap set for raccoons. Any marsh rabbits caught would be released unharmed and reported to the appropriate wildlife agency, which would avoid any significant impacts on the species. Also, an indirect beneficial effect would be a reduced risk of the species contracting and dying of rabies.

The proposed action would have no effect on any of the other listed species in the states involved in the proposed action (see Appendices C and D).

Regional Forester Sensitive Species (USDA-Forest Service listing) Region 9, Eastern Region:

- **River Otter** (*Lutra canadensis*). This species is designated as Regional Forester Sensitive in Wayne National Forest in Ohio.
- **Bobcat** (*Lynx rufus*). This species is designated as Regional Forester Sensitive in Wayne National Forest in Ohio.
- **American Marten** (*Martus Americana*). This species is designated as extirpated from Allegheny National Forest in Pennsylvania and Green Mountain National Forest in Vermont.
- **American Black Bear** (*Ursus americanus*). This species is designated as Regional Forester Sensitive in Wayne National Forest in Ohio.
- **American Badger** (*Taxidea taxus*). This species is designated as Regional Forester Sensitive in Hoosier National Forest in Indiana.

The aforementioned species were previously discussed in the federal or state listed species sections. The proposed action would have no effect on any of these or other listed species on the national forests located within the ORV zone.

Regional Forester Sensitive Species (USDA-Forest Service listing) Region 8, Southern Region:

- **Florida Black Bear** (*Ursus americanus floridanus*). This species is designated as Regional Forester Sensitive in National Forests in Alabama and Florida.
- **Round-tailed Muskrat** (*Neofiber alleni*). This species is designated as Regional Forester Sensitive in National Forests in Florida.
- **Sherman's Fox Squirrel** (*Sciurus niger shermani*). This species is designated as Regional Forester Sensitive in national forests in Florida.

The aforementioned species were previously discussed in the federal or state listed species sections. The proposed action would have no effect on any of these or other listed species on the national forests located within the ORV zone.

4.1.4 Potential for Adverse Effects on Pet Dogs or Other Domestic Animals that Might Consume the Baits.

Rupprecht et al. (1992a) and Pastoret et al. (1995) summarized the results of V-RG safety trials in nontarget species. The studies included oral vaccination of domestic dogs, cats, cattle, and sheep and found no adverse effects on those species. More than 43.75 million ORV baits using the RABORAL V-RG® vaccine have been distributed in the U.S. during the APHIS-WS program thus far with no reported adverse effects on domestic animals. There is no evidence of potential harm to target or nontarget species, including domestic dogs, cats, cattle, and sheep, from overdosage of RABORAL V-RG® vaccine by any route; a number of species have been dosed with 2 to 10 times the amount of vaccine in an individual ORV bait without adverse effects (USDA 1991, p. 47; Rupprecht et al. 1992a). Therefore, even if domestic animals received multiple doses of vaccine by consuming multiple baits, no adverse effects would be expected to occur.

As discussed in Section 4.1.1.2, a recent study indicates vaccinia virus that originated from a strain used in smallpox vaccinations in Brazil may have become established in domestic cows in that country (Damaso et al. 2000). This indicates there is some potential for use of vaccinia virus in vaccinations to result in a new emerging infectious disease in domestic animals; however, there is currently no evidence that this type of phenomenon has occurred in the U.S. (C. Rupprecht, CDC, pers. comm. 2001). Also, the vaccinia virus strain used for smallpox vaccination in Brazil was different than the strain that is currently used in the V-RG vaccine, and the vaccinia virus portion of V-RG is more attenuated (i.e., *weaker*) than strains used in smallpox vaccines (USDA 1991, p. 18-19). Thus, it is less likely that V-RG would result in the establishment and persistence of vaccinia virus in wild animal populations.

Instances have been reported where a pet dog has consumed several baits and then vomited the plastic sachets (R. Hale, Ohio Dept. of Health, pers. comm. 2001). Reports of these types of instances have been few, and the dogs have reportedly not experienced any substantive or long term adverse effects. USDA (2004c) documented that of the 43.75 million baits distributed during the APHIS-WS program between 1995 and 2003 only 424 instances have been reported where a pet or other domestic animal had contact with a bait. This equates to 1 domestic exposure per 103,184 baits disbursed or 0.00096 percent contact cases. No cases of adverse reaction in pets or other domestic animals have ever been reported during the APHIS-WS program. In addition, USDA (2004c) documented that 146 incidents were reported where pets came into contact with a bait in 2003; however, no reports of pets or other domestic animals experiencing any type of adverse reaction were submitted. Domestic animals that bite into and ingest a bait are most likely to be immunized against rabies or receive a boost from a previous vaccination. USDA (2004c) also documented the number of baits distributed in those states conducting ORV programs and the number of people who reported contact or potential contact with a bait by their pet or other domestic animal (i.e., carrying bait in mouth, chewing bait, vomiting sachet). The number of documented exposures equates to 0.0014 percent of the 10.26 million baits distributed in 2003 or one domestic animal exposure per 70,252 baits distributed. The domestic animals reported to have been exposed to a bait involved 122 dogs, 6 cats, 1 cow, 1 horse, 1 alpaca, and 15 unknown/unidentified animals. In the monitoring report (USDA 2004c), APHIS-WS concluded that adverse cumulative impacts to pets and other domestic animals continue to be negligible.

4.1.5 Potential for the Recombined V-RG Virus to "Revert to Virulence" and Result in a Virus that could Cause Disease in Humans or Animals.

The concern here is whether the V-RG recombinant virus is genetically stable so that it would not become virulent (i.e., capable of causing disease) after it replicates (or reproduces) in animals that eat ORV baits containing the RABORAL V-RG® vaccine and, perhaps, be transmitted on to other animals. This issue was addressed in previous EAs and in formal risk assessments by APHIS (USDA 1991, p. 41-42; USDA *undated a, undated b*). The Wistar Institute conducted experiments with mice in which the V-RG was "subpassaged[4]" four times into groups of mice (results cited in USDA 1991, p. 41). The V-RG virus could not be found after passage through the second or third groups of mice. The experiments demonstrated that the ability of the V-RG virus to cause disease does not increase by repeated animal passage, thus "reversion to virulence" is unlikely. Further alleviating the concern about this issue is the evidence that V-RG virus does not transmit readily to other animals from animals that have consumed ORV baits (Rupprecht and

[4] This means the V-RG was inoculated into one group of mice from which material containing the virus was obtained later and injected into a second group of mice, and then material obtained from the second group was injected into a third group, etc., until four such passages had been conducted.

Kieny 1988).

4.1.6 Potential for the RABORAL V-RG® Vaccine to Recombine with Other Viruses in the Wild to Form New Viruses that could Cause Disease in Humans or Animals.

The concern here is whether the RABORAL V-RG® vaccine in the ORV baits might encounter other viruses in animals, exchange genetic material with them during replication, and result in new viruses that could cause serious diseases in humans or animals. This potential recombination has been recognized as being more probable with wild pox viruses that are genetically similar to the vaccinia virus used as the vector in the RABORAL V-RG® vaccine.

Wild pox viruses present in the U.S. include skunk, rodent, and raccoon pox viruses (C. Rupprecht, CDC, pers. comm. 2001). One type of wild pox virus that would logically be considered for the possibility of recombination with vaccinia virus is raccoon pox (RP) which could occur in raccoons targeted by ORV programs in the eastern U.S. For this type of unanticipated spontaneous recombination to occur, the V-RG and RP would have to simultaneously infect the same cells in the same animal at the same time. RP has not been found to be prevalent in the environment, with only two concurrent isolations (or detections) of it having occurred in the U.S. (Herman 1964, cited in USDA 1991, p. 42). Laboratory experiments on mice infected with RP and inoculated with V-RG showed no adverse effects on the mice (USDA, 1991, p. 42).

The Wistar Institute identified three circumstances that would have to occur simultaneously for there to be a chance of a hazardous recombination between V-RG and RP virus: (1) they would have to occur at the same time in the same animal; (2) "genome contact" (i.e., contact between the actual genetic material in the two viruses as they replicate in an infected cell); *and* (3) the regeneration of the gene that was previously removed from the vaccinia virus (known as the thymidine kinase "TK" gene) (USDA 1991, p. 42). Wistar determined the probability of all three circumstances occurring at the same time was 1 chance in 100 million or less (USDA 1991, p. 42). Also, if this did somehow occur resulting in a recombined virus with the functional "TK" gene reestablished, the properties and virulence of the new virus would probably be similar to the original recipient virus which is vaccinia (USDA *undated b*, p. 28). Vaccinia only causes mild short-term symptoms in most cases (i.e., similar to the localized rash and pustules that occurred on the arms of many persons who received smallpox vaccinations) (USDA 1991, p. 39; Elvinger 2001). Thus, recombination with wild viruses is unlikely, but, if it did occur, it is also unlikely to result in significant adverse effects on animals or people.

The combination of two types of pox viruses in rabbits or hares (leporipoxviruses) has been known to occur (Omlin 1997), but the combination of a leporipoxvirus with another unrelated pox virus has not been known to occur (USDA 1991, p. 42). Rare examples of recombination between different poxviruses in animal hosts have been documented, although the probability of two viruses infecting the same cell at the same time (which is required for recombination to occur) under natural conditions remains very low (Omlin 1997). Recombination of V-RG with viruses other than orthopoxviruses is not likely (Omlin 1997). In formal risk analyses, APHIS concluded that the probability of recombination with other orthopoxviruses would be limited due to the low prevalence of orthopoxviruses in wildlife species in the U.S. (USDA *undated a, undated b*).

Hahn (1992) concluded that vaccines developed by the newer recombinant techniques such as the ones used to make V-RG vaccine, are no more hazardous than vaccines created by more conventional methods (e.g., "attenuation" and "fractionation"). He further indicated that, with recombinant technology, the potential for ending up with a dangerous virulent strain is probably less than with the older "hit-or-miss" methods, because the specific genetic material responsible for making a virus virulent can be removed or altered which makes the virus safer.

This analysis, which incorporates previous analyses by reference, supports a conclusion that adverse environmental effects from spontaneous recombination of V-RG with other wild viruses are exceedingly unlikely. This is further supported by the fact there have been no observed adverse effects in wildlife and humans both in Europe and North America following a number of years of experimental and field use of the V-RG vaccine.

4.1.7 Potential for Aerially Dropped Baits to Strike and Injure People or Domestic Animals.

ORV baits would be distributed from aircraft at an average density of 27 baits per km^2 (70 baits per mi^2) in the coyote rabies zone and 39 baits per km^2 (100 baits per mi^2) in the gray fox rabies zone in Texas under the proposed action. Bait density would average 75 baits per km^2 (194 baits per mi^2) in eastern states where raccoon rabies is targeted. These densities are sparse enough to predict that the chance of a person being struck and harmed by a falling bait is extremely remote. For example, if 100 persons were standing outdoors in a square mile of area in which ORV baits were being dropped, and each person occupies about 2 square feet of space at the time that baits were dropped, the chance of being struck would be 1 in 139,000 (200 ft^2 total space occupied by persons divided by 27.8 million ft^2 per mi^2). The negligible risk of being struck is further supported by the fact that out of more than 43.75 million baits distributed in the U.S. by APHIS-WS between 1995 and 2003, only 9 incidents have been reported in which a person claimed to have been struck by a falling bait (0.00002% chance of being struck by a bait or 1 strike per 4.86 million baits dropped) (USDA 2004c). None of the reports since APHIS-WS' ORV program inception have resulted in any injury or harm to the individuals involved. Eight of these incidents occurred in Pennsylvania, Texas, Ohio, and Ontario and did not result in any significant injury or harm to the individuals involved (G. Moore, TX Dept. of Health, pers. comm. 2001; R. Hale, OH Dept. of Health, pers. comm. 2001; C. MacInnes, Ontario Ministry of Natural Resources, pers. comm. 2001).

Of the 10.26 million baits that were distributed by APHIS-WS in 2003, 4 incidents were reported in which a person claimed to have been struck by a falling bait (1 strike per 2.56 million baits dropped in 2003). All 4 incidents were reported in Pennsylvania where baiting was conducted in more urbanized areas (1 strike per 427,600 baits disbursed in Pennsylvania). No reports of injury were received during the 2003 APHIS-WS ORV program (USDA 2004c). In 2003, no cases were documented involving falling baits striking or injuring domestic animals. In 2003, reports were received regarding baits striking property. The reports involved 3 trucks, 1 car, 1 sunroof, and 3 swimming pools in Pennsylvania; 1 swimming pool in West Virginia; and 1 house in Georgia (reported to the Alabama Health department) (USDA 2004c). The potential for falling baits to strike or injure people or domestic animals continues to be insignificant. Impacts of the program on this issue are expected to remain negligible. The potential for baits to strike people or animals is further mitigated by the fact that bait disbursal crews avoid dropping baits into cities, towns, and other areas with human dwellings, or if humans are observed below. Hand placement or dropping of baits from slower moving helicopters to allow for more precise control over the areas on which the baits are dropped would primarily be used in urban parks or suburban situations, which would further reduce the risk of being struck.

4.1.8 Cost of the Program in Comparison to Perceived Benefits.

4.1.8.1 Raccoon Rabies ORV Programs.

Meltzer (1996) described a model for estimating the costs and benefits of using oral vaccines to stop or prevent raccoon rabies and identified factors important for consideration. Preventing raccoon rabies from moving into an area is generally much less expensive than the cost of elimination. The cost of eliminating raccoon rabies from New York using ORV was estimated at $72.9 million over a 10-year period. Statewide cost of raccoon rabies was estimated at $0.23 per capita pre-epizootic to $0.89 per capita once the area became infected. Comparing 1990 to 1994, New York found the rabies epizootic increased that state's annual costs over $10 million per year (Huntley et al. *unpublished* 1996).

Benefit-cost ratios of using V-RG vaccine in oral baits to control raccoon rabies in two counties in New Jersey were estimated by Uhaa et al. (1992). In that study, the estimated value of benefits was 2.21 times the cost for the most expensive vaccination program. The least expensive program resulted in benefits that exceeded costs by a factor of 6.8. The authors concluded that the program would be cost effective (Uhaa et al. 1992).

Kemere et al. (2001) conducted a detailed analysis of the expected costs compared to the expected value of benefits for establishing a barrier to prevent further westward spread of raccoon rabies that would extend from Lake Erie to the Gulf of Mexico. The barrier would combine natural barriers provided by geographical features such as the Appalachian Mountains with ORV zones. All program costs and benefits (in terms of avoided costs) were discounted to present values to provide valid comparisons. The types of costs avoided by preventing the westward spread of raccoon rabies included post-exposure vaccination treatments for humans, need for increased livestock vaccinations, and costs of increased surveillance and monitoring of rabies in wildlife and domestic animals (including laboratory diagnostic costs, costs of preparing samples for testing, and animal bite investigations). The analysis did not factor in an economic benefit for lives saved. It also did not factor in the potential benefit of decreased costs associated with nuisance and damage by raccoons or of raccoon impacts on ground nesting birds that might occur if the epizootics were not treated and raccoon populations declined as a result. It is probable that such a potential benefit would be short term (1-3 years) until local raccoon populations recovered, or were affected by other disease cycles. However, these types of outcomes are largely unpredictable.

Costs of establishing and maintaining the raccoon rabies barrier are estimated to total between $58 million and $148 million, while the estimates of net benefits ranged between $48 million and $496 million. The analysis indicated that a large scale ORV program should be economically feasible and that net economic benefits would most likely be substantial (Kemere et al. 2001).

Since ORV program inception, positive rabies cases have either decreased or the advance of the virus has been slowed or stopped in each state where an ORV program was initiated.

- In Maryland, 18 rabies cases were reported per year on the Annapolis Peninsula alone before the ORV program began in 1998. From 2000-2002 and 2003, Maryland reported zero cases and one case, respectively (USDA 2004a, 2004c).

- In New York, an ORV program was implemented in 1998 to prevent the northward spread of the virus. Prior to the ORV program in New York, almost 150 positive rabies cases were recorded in 1998 and 1999. In 2002, New York reported a decline to 4 positive rabies cases, of which only one was attributed to a raccoon, and zero cases have been reported since (USDA 2004a, 2004c). A recently completed project in Albany and Rensselaer Counties of New York State demonstrated that raccoon rabies may be virtually eliminated from an area where the disease had been present for a number of years by use of ORV.

- In Vermont, before the program was started in 1996, positive rabies cases were found 73 km. (45.5 miles) south of the Quebec, Canada border. With an annual rate of spread of rabies at 56.3 km/year (35 miles/year), positive raccoon strain rabies cases should have reached the Canada border as early as 1999. However, the border has not yet been breached (USDA 2004a, 2004c). Annual vaccination projects in the Lake Champlain Valley in Vermont and New York have shown promise in preventing the northward spread of raccoon rabies. Raccoon rabies has moved through much of the St. Lawrence River Valley in northern New York with the appearance of two raccoon rabies foci (i.e., point locations of rabies cases) in southern Ontario. Cooperative efforts with Ontario and the implementation of point infection control strategies in Ontario around these foci are under evaluation to determine if the raccoon variant of the rabies virus can be contained and eliminated (L. Bigler, pers. comm. 2001).

- In Ohio, 62 positive rabies cases were recorded prior to program implementation in 1997. From 2001-2003, three cases were reported near the Pennsylvania border where raccoon rabies is still enzootic. In 2001, APHIS-WS, in coordination with state agencies, began an ORV program in Pennsylvania (USDA 2004a, 2004c) to address this issue. The ability to create rabies-free zones, within raccoon rabies enzootic areas, is a requisite to achieve elimination of this variant of the rabies virus.

  In mid-July 2004, a raccoon infected with raccoon variant of the rabies virus was confirmed just west of the ORV zone near Lake Erie in Lake County in northeastern Ohio. This cooperative ORV project began in 1997 and has expanded to include the states of Pennsylvania, West Virginia, Virginia, Tennessee, Maryland, Georgia and Alabama. Throughout its length from Ohio to northeastern Alabama, the ORV zone is at least 30-miles in width to attempt to prevent the westward spread of raccoon rabies. APHIS-WS and state, county and municipal cooperators responded immediately to this high priority rabies issue. A contingency action plan that included enhanced rabies surveillance, trap-vaccinate-release, and ORV was implemented upon detection of the index case. High raccoon population densities and additional rabies cases based on enhanced surveillance suggest that additional action may be required. Enhanced rabies surveillance is being maintained on the south and west sides of this outbreak to determine the next course of action, if required.

- In Massachusetts, the rabies virus had not spread to the Cape where intensive baiting programs at the peninsular neck (since 1995), combined with the natural barrier of Cape Cod Canal, seemed to act as effective barriers (Robbins et al. 1998). In early March 2004, however, raccoon variant of the rabies virus was confirmed east of the Cape Cod Canal for the first time. The canal served as the eastern anchor point for the ORV zone which was designed to prevent raccoon rabies from spreading east onto the Cape. This cooperative project was initiated in the mid-1990s by Tufts University and the State of Massachusetts Health Department. APHIS-WS became a partner in this effort in 2001. APHIS-WS, Tufts University, and the State of Massachusetts Health Department immediately implemented enhanced rabies surveillance, followed by trap-vaccinate-release and ORV as a contingency action plan to prevent further spread, with the long range goal of eliminating raccoon rabies from the area. It is not known if raccoon rabies spread to the Cape through the long range movement of an individual rabid raccoon or skunk infected with raccoon variant of the rabies virus or if the virus spread animal to animal approaching the canal, with rabies spreading to the Cape through a short range raccoon or skunk movement across the canal. Translocation, either intentional or unintentional (i.e., raccoon "hitch-hiking" in a garbage truck or tailored boat and escaping once on the Cape), represents another other potential source of spread.

- In June 2003, the rabies front, which had stalled in North Carolina, finally moved west and crossed over the Appalachians into upper east Tennessee (6 raccoon strain cases were reported). In attempt to stay ahead of the rabies front, APHIS-WS extended the ORV baiting area into Tennessee (USDA 2004a, 2004c).

- Projects have also been conducted or are in progress in New Jersey (1992-1994, with additional projects reinitiated in the last couple of years), Florida (1995-present), Virginia (2000-present), West Virginia (2001-present), Pennsylvania (1995-present), NH (2002-present), AL (2003-present), GA (2003-present), and ME (2003-present).

Surveillance activities were conducted to assess aerial and/or ground ORV baiting efficacy, summer versus fall baiting schedules, and seasonal raccoon movement in a number of states. Numerous density studies were also conducted in the majority of participating states to determine raccoon densities in relation to habitat, elevation, and numbers of baits distributed. In areas where raccoon densities are low, baiting may be reduced to increase cost effectiveness of the ORV program (USDA 2004a).

4.1.8.2 Gray Fox and Coyote Rabies ORV Programs in Texas.

Although no detailed economic analysis of the costs and benefits of the gray fox and coyote rabies programs has been conducted, the assumption about the potential spread of rabies across much of the U.S. without effective ORV programs is most likely also valid for the gray fox and coyote rabies variants. Thus, it is probable that the Texas ORV programs would be found to be cost effective under similar analysis.

- Since 1995, 9.35 million vaccine-laden baits have been distributed in south Texas in an ORV program that has proved to be highly effective in the elimination of the canine rabies strain in that area. Prior to the ORV program, 166 canine strain rabies cases were reported in Texas. One case was reported in 2001 along the Texas-Mexico border and zero cases have been reported since. Similar success is sought in the gray fox epizootic in west-central Texas where 10.6 million vaccine-laden baits have been distributed. In 2002, 18 positive cases of gray fox strain rabies occurred outside the barrier, possibly due to an interrupted baiting program in 2000 and 2001 as a result of a lack of funding. Increased funding was provided for the 2003 gray fox ORV program in Texas in order to encircle the zone where positive cases have been reported and blanket the area (USDA 2004a, 2004c).

4.1.9 Humaneness of Methods Used to Collect Wild Animal Specimens Critical for Timely Program Evaluation or to Reduce Local Populations of Target Species under State Contingency Plans.

Some people would view methods employed to capture and/or kill raccoons, gray fox, coyotes, and other wild animals for monitoring and surveillance or local depopulation purposes as inhumane. Humaneness, as it relates to the killing or capturing of wildlife is an important but complex concept that can be interpreted in a variety of ways. Humaneness is a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently.

However, humaneness as it relates to the natural world through natural mortality versus man-induced mortality must be brought into perspective. DeVos and Smith (1995) explain the characteristics of natural mortality in wildlife populations. There seems to be an increasing public perception that, left alone by humans, animal populations will experience few premature deaths and live to an old age without harm, pain or suffering. It should be recognized that wildlife populations reproduce at far greater rates than would be necessary to replace deaths if all lived to old age. To counterbalance this high reproduction, it is natural for most individuals of most species to die young, often before reaching breeding age. Natural mortality in wildlife populations includes predation, malnutrition, disease, inclement weather, and accidents. These "natural" deaths are often greater in frequency than human-caused deaths through regulated hunting, trapping, and wildlife damage management operations. From the standpoint of the animal, these natural mortality factors also may cause more suffering by wildlife, as perceived by humans, than human-induced mortality. Under given habitat conditions, most wildlife populations fluctuate around a rather specific density, sometimes called the carrying capacity. Populations that overshoot this density via reproduction become very sensitive to various sources of mortality, and death rates increase. Conversely, as populations drop, mortality rates decline (DeVos and Smith

1995). Thus, human-induced mortality, which often involves much less suffering of individual animals, invariably lessens mortality from other sources. For example, it would seem that an animal taken in a leg-hold trap or by a snare, would certainly suffer less than if it died from rabies.

Research suggests that with some methods, such as restraint in leghold traps, changes in the blood chemistry of trapped animals indicate "stress." Blood measurements indicated similar changes in foxes that had been chased by dogs for about five minutes as those restrained in traps (USDA 1997j). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness. The challenge in coping with this issue is how to achieve the least amount of animal suffering with the constraints imposed by current technology. To insure the most professional handling of these issues and concerns, APHIS-WS has policies giving direction toward the achievement of the most humane program possible while still accomplishing the program's mission.

APHIS-WS has made modifications to management devices through research and development which have increased selectivity toward the species being targeted. Research is continuing with the goal of bringing new findings and products into practical use. Until such time as new findings and products are found to be practical, some animal suffering will occur during lethal collection of animal specimens if monitoring and program effectiveness objectives are to be met.

4.2 Alternative 2 -- No Action (No Involvement by APHIS-WS in Rabies Prevention or Control)

4.2.1 Potential for Adverse Effects on People that Become Exposed to the Vaccine or the Baits.

Under this alternative, no APHIS-WS funds would be available for purchasing ORV baits. The states would still likely fund ORV programs to some degree without APHIS-WS' assistance. They may seek other sources of federal funds to complement state or other sources of funding. Thus, people would still have the potential to come into contact with baits or the vaccine; however, the potential would be less. Actual risks of adverse effects from exposure to vaccinia virus would still be exceedingly low and insignificant.

It is conceivable that federal coordination of ORV programs would actually result in fewer numbers of ORV baits used over the years or that ORV bait use in many areas would be for shorter time periods. This is because effective federal coordination may have a better chance of stopping or even eliminating one or more of the several rabies strains from large areas than if the individual states are left to themselves to conduct ORV programs.

4.2.1.1 Potential to Cause Rabies in Humans.

The no action alternative would most likely result in greater risk of human exposure to rabies than the proposed action because state-run ORV programs without APHIS-WS funds would have less chance of being successful in stopping or preventing the spread of the three rabies variants. Therefore, an absence of APHIS-WS cooperative funding could be expected to result in increased risk of human rabies cases because of expanding epizootics. The V-RG vaccine would not cause rabies under any expected scenario involving the distribution of ORV baits.

4.2.1.2 Potential for Vaccinia Virus to Cause Disease in Humans.

Under the no action alternative, V-RG oral vaccine containing the vaccinia virus vector would still be available for state-approved use in ORV programs. Such programs would probably be on a lesser scale without APHIS-WS funds. The potential for vaccinia-related disease cases would be lower than under the proposed action. The likelihood that any cases would occur is extremely remote under any expected scenario involving the distribution of ORV baits.

4.2.1.3 Potential to Cause Cancer (Oncogenicity).

Under the no action alternative, V-RG oral vaccine containing the vaccinia virus vector would still be available for state-approved ORV programs but would probably be used on less total land area without APHIS-WS funds. Because vaccinia virus used in the V-RG vaccine is not a cancer-causing agent, expected scenarios involving the use of ORV baits by the states would not result in increased cancer risks.

Based on this information, risks to humans from contact with the V-RG vaccine are believed to be minimal with or without APHIS-WS funding or assistance. The risk and potential severity of adverse effects from rabies exposures in humans would probably be greater without ORV programs than would be the risk of serious adverse effects from vaccinia virus infections with ORV programs.

4.2.2 Potential for Adverse Effects on Target Wildlife Species Populations.

It is most likely that fewer raccoons, gray foxes and coyotes in the proposed ORV zones would be vaccinated against rabies without APHIS-WS funds to contribute to ORV bait purchases and distribution. Therefore, more animals would likely die from rabies with potentially greater short-term population impacts. Such impacts would be expected to recur as raccoon, gray fox or coyote populations have strong capabilities to recover (Connolly and Longhurst 1975, Fritzell 1987, and Sanderson 1987), which would establish new populations susceptible to rabies mortality. If the state ORV programs failed for lack of APHIS-WS assistance, rabies epizootics may be expected to occur that would likely result in short-term die-offs of target species over broader geographic areas.

4.2.2.1 Effects of the ORV V-RG Vaccine on Raccoons, Gray Foxes, and Coyotes.

Under the no action alternative, states would still be able to employ the V-RG oral vaccine to combat raccoon rabies, and Texas would still be able to use V-RG to combat gray fox and coyote rabies. As concluded in the analysis in Section 4.1.2, baits using the V-RG vaccine would have no adverse impact on raccoon, gray fox, or coyote populations.

4.2.2.2 Effects of Monitoring/Surveillance or Localized Population Reduction (Contingency Actions) on Raccoon Populations in Eastern States.

Under the no action alternative, states would still likely implement some level of monitoring, control, and, potentially, implementation of contingency actions in response to breaches in vaccination barriers that result in localized population suppression to attempt to maintain the integrity of vaccination barriers. The numbers of raccoons killed under such programs would probably be less than if APHIS-WS funds and personnel were available. Therefore, as supported by the analysis in Section 4.1.2.2, effects on raccoon populations would be insignificant.

4.2.2.3 Effects of Monitoring/Surveillance or Localized Population Reduction (Contingency Actions) on Gray Fox Populations in Texas.

Under the no action alternative, the State of Texas would likely still conduct monitoring, surveillance and local depopulation activities without APHIS-WS assistance; however, such activities would probably occur on a lesser scale. Therefore, as supported by the analysis in Section 4.1.2.3, effects on gray fox populations would be insignificant.

4.2.2.4 Effects of Monitoring/Surveillance or Localized Population Reduction (Contingency Actions) on Coyote Populations in Texas.

Under the no action alternative, the State of Texas could still conduct monitoring, surveillance and local depopulation activities even without APHIS-WS assistance, but such activities would probably occur on a lesser scale. Therefore, as supported by the analysis in Section 4.1.2.4, effects on coyote populations would be insignificant.

4.2.3 Potential for Adverse Effects on Nontarget Wildlife Species, including Threatened or Endangered Species.

4.2.3.1 Effects of the V-RG Vaccine on Nontarget Wildlife including Threatened or Endangered Species.

Under the no action alternative, there would be no potential for APHIS-WS assistance to result in adverse impacts on nontarget wildlife because of ORV programs. However, states would still be free to conduct ORV programs using the V-RG vaccine. Such programs would probably be conducted on a reduced scale without APHIS-WS funds. However, based on the analysis in Section 4.1.3, there is almost no potential for adverse effects on nontarget wildlife because of ORV bait consumption under any scenario involving the distribution of baits containing the V-RG vaccine.

4.2.3.2 Effects of Capture/Removal Methods (Used in Monitoring and Surveillance or to Reduce Local Populations of Target Species under State Contingency Plans) on Nontarget Species, including Threatened or Endangered Species.

Under the no action alternative, the potential for APHIS-WS assistance to result in adverse impacts on nontarget wildlife would be zero. However, states could still conduct ORV programs and monitoring that include the capture and/or killing of wild animals for monitoring purposes or localized depopulation under contingency plans. The potential effect on nontarget wildlife and T&E species from methods used in monitoring and surveillance programs would be less than the proposed action, but, similar to the proposed action, would be insignificant.

4.2.4 Potential for Adverse Effects on Pet Dogs or Other Domestic Animals that Might Consume the Baits.

Under the no action alternative, the potential for APHIS-WS assistance to result in adverse impacts on domestic pets or other domestic animals would be zero. However, states could still conduct ORV programs, but such programs would probably be accomplished on a reduced scale without APHIS-WS funds. Based on the analysis in Section 4.1.4, there is almost no potential for adverse effects on domestic animals because of ORV bait consumption under any scenario involving the distribution of baits containing the V-RG vaccine. On the other hand, failure to stop or prevent the spread of rabies would result in adverse effects on domestic animals by increasing their likelihood of exposure to rabid wild animals.

4.2.5 Potential for the Recombined V-RG Virus to "Revert to Virulence" and Result in a Virus that could Cause Disease in Humans or Animals.

Under the no action alternative, ORV baits with the V-RG vaccine would probably still be used by the states even without APHIS-WS funds, although such use would likely be on a reduced scale. As shown by the analysis in Section 4.1.5, the potential for serious environmental effects with regard to this issue is very low.

4.2.6 Potential for the V-RG Virus to Recombine with Other Viruses in the Wild to Form New Viruses that could Cause Disease in Humans or Animals.

Under the no action alternative, ORV baits with the V-RG vaccine would probably still be used by the states even without APHIS-WS funds, although such use would likely be on a reduced scale. As shown by the analysis in Section 4.1.6, the potential for serious environmental effects with regard to this issue is very low.

4.2.7 Potential for Aerially Dropped Baits to Strike and Injure People or Domestic Animals.

Under the no action alternative, the potential for APHIS-WS assistance to result in this risk would be zero. States could still implement ORV programs, but such programs would probably be accomplished on a lesser scale without APHIS-WS funds. As discussed in Section 4.1.7, the risk of persons or animals being struck by ORV baits is extremely remote.

4.2.8 Cost of the Program in Comparison to Perceived Benefits.

Under the no action alternative, the states or others would be left to conduct ORV programs in the absence of APHIS-WS participation. Without APHIS-WS funds and assistance, such programs would probably be conducted on a reduced scale and may be less successful in stopping the forward advance of the three rabies variants across much of the U.S. Overall program costs would decline, but benefits, in terms of avoided costs (described in Section 4.1.8), would also decline with the most likely result being greatly increased state and private costs to monitor and vaccinate for rabies across large areas of the U.S. It is believed that, based on the analysis in Section 4.1.8, the increased state and private costs resulting from failure to stop the spread of the rabies variants would exceed by a substantial margin the savings in program costs that would occur by implementing the no action alternative. Thus, the benefit-cost ratio of this alternative would be expected to be much less (i.e., less desirable) than that of the proposed action.

4.2.9 Humaneness of Methods Used to Collect Wild Animal Specimens Critical for Timely Program Evaluation or to Reduce Local Populations of Target Species under State Contingency Plans.

Under the no action alternative, APHIS-WS would not assist in collecting wild animal specimens for ORV monitoring programs or for local population suppression efforts under contingency plans to address local rabies outbreaks beyond ORV barriers. States would still most likely conduct such programs on their own, although to a lesser degree without APHIS-WS funds and personnel. The primary method that would be used by APHIS-WS to capture raccoons (cage traps) would also most likely be the primary method used by state programs, although possibly to a lesser degree. It is probable that the methods that would be used by APHIS-WS to capture or kill gray fox and coyotes in Texas for rabies monitoring would also be used to a lesser degree without APHIS-WS funds and personnel. Thus, some persons would view this as being a more humane alternative because of the lower intensity of the methods used.

Failure of a successful ORV program would likely result in an increased, but varying, proportion of the raccoon, gray fox, coyote, and other wild mammal species populations succumbing to rabies when exposed to the various specific strains. The symptoms of rabies include insomnia, anxiety, confusion, slight or partial paralysis, excitation, hallucinations, agitation, hypersalivation, difficulty swallowing, and hydrophobia (fear of water) (CDC 2001a). Some persons might argue that dying from rabies, which can take several days once symptoms appear, results in more animal suffering than being captured or killed by monitoring and surveillance activities. In any event, it is almost certain that much larger numbers of animals would succumb to rabies without effective ORV programs than would experience stress and suffering from being captured or killed by monitoring activities. The numbers dying of rabies could increase dramatically as epizootics of specific strains spread across larger areas of the U.S. With this in mind, it would appear that, on balance, the implementation of successful ORV programs that include animal collections for monitoring results in less animal suffering than taking no action.

4.3 Alternative 3 -- Live-Capture-Vaccinate-Release Programs.

4.3.1 Potential for Adverse Effects on People that Become Exposed to the Vaccine or the Baits.

Under this alternative, APHIS-WS would not provide funds to purchase or distribute ORV baits but would provide such funds for live-capture-vaccinate-release programs. For purposes of comparison, it is assumed that, with adequate APHIS-WS funding to conduct these types of programs, states would choose not to implement ORV programs.

4.3.1.1 Potential to Cause Rabies in Humans.

Live-capture-vaccinate-release programs might be as effective as ORV programs in stopping the spread of the three variants of rabies if conducted throughout all areas where ORV programs would have been conducted under the proposed action. The method itself would not present risk of causing rabies in members of the public. The risk of increases in human rabies cases because of the failure to stop epizootics of raccoon, gray fox, and coyote rabies would be about the same as with ORV programs under the proposed action.

4.3.1.2 Potential for Vaccinia Virus to Cause Disease in Humans.

Because it is assumed that ORV using the vaccinia virus vector in V-RG would not be used by states or by APHIS-WS, there should be no risk of vaccinia virus infections in humans caused by contact with the vaccine from ORV baits.

4.3.1.3 Potential to Cause Cancer (Oncogenicity).

No increased risk of cancer would result from this alternative.

4.3.2 Potential for Adverse Effects on Target Wildlife Species Populations.

Under this alternative, APHIS-WS would not provide funds for ORV purchase and distribution but would assist in monitoring and surveillance programs involving the capture or lethal collection and testing of wild raccoons, gray foxes, and coyotes following live-capture-vaccinate and release activities.

4.3.2.1 Effects of the ORV V-RG Vaccine on Raccoons, Gray Foxes, and Coyotes.

Under a live-capture-vaccinate-release alternative, it is expected that little or no ORV use by the states would occur. Thus, there would be little or no potential for the V-RG oral vaccine to affect these species.

4.3.2.2 Effects of Monitoring/Surveillance or Localized Population Reduction (Contingency Actions) on Raccoon Populations in Eastern States.

Under a live-capture-vaccinate-release alternative, it is expected that extent of lethal removal of raccoons for monitoring/surveillance activities or localized population reduction under contingency plans to address rabies outbreaks would be similar to the proposed action. Thus, the impact on populations of raccoons would be similar to the proposed action and would be very low.

4.3.2.3 Effects of Monitoring/Surveillance or Localized Population Reduction (Contingency Actions) on Gray Fox Populations in Texas.

Under a live-capture-vaccinate-release alternative, it is expected that extent of lethal removal of gray fox in Texas for monitoring/surveillance activities or localized population reduction under contingency plans to address rabies outbreaks would be similar to the proposed action. Thus, the impact on populations of gray fox in Texas would be similar to the proposed action and would be low.

4.3.2.4 Effects of Monitoring/Surveillance or Localized Population Reduction (Contingency Actions) on Coyote Populations in Texas.

Under a live-capture-vaccinate-release alternative, it is expected that the extent of lethal removal of coyotes in south Texas for monitoring/surveillance activities or localized population reduction under contingency plans to address rabies outbreaks would be similar to the proposed action. Thus, the impact on populations of coyotes in south Texas would be similar to the proposed action and would be low.

4.3.3 Potential for Adverse Effects on Nontarget Wildlife Species, including Threatened or Endangered Species.

4.3.3.1 Effects of the V-RG Vaccine on Nontarget Wildlife, including Threatened or Endangered Species.

Under a live-capture-vaccinate-release alternative, it is expected that little or no ORV use by the states would occur. Thus, there would be no potential for the V-RG oral vaccine to affect nontarget species. Live-capture-vaccinate-release programs would be virtually 100 percent selective for target species and would therefore have little or no potential to affect nontarget wildlife.

4.3.3.2 Effects of Capture/Removal Methods (Used in Monitoring and Surveillance or to Reduce Local Populations of Target Species under State Contingency Plans) on Nontarget Species, including Threatened or Endangered Species.

Under this alternative, APHIS-WS would continue to assist in monitoring activities and, potentially, in localized contingency plans that involve the use of lethal methods such as those discussed under the proposed action. The potential for effects on nontarget species would be similar to the proposed action. The analysis in Section 4.1.3.2 shows effects on nontarget and T&E species would be negligible.

4.3.4 Potential for Adverse Effects on Pet Dogs or Other Domestic Animals that Might Consume the Baits.

Live-capture-vaccinate-release programs would pose no risk of inadvertent vaccine exposure to pets or other domestic animals.

4.3.5 Potential for the Recombined V-RG Virus to "Revert to Virulence" and Result in a Virus that could Cause Disease in Humans or Animals.

Under this alternative, it is assumed that the states would not use ORV baits with the V-RG vaccine. Thus, there would be no potential for the V-RG virus to revert to a more virulent strain.

4.3.6 Potential for the V-RG Virus to Recombine with Other Viruses in the Wild to Form New Viruses that could Cause Disease in Humans or Animals.

Under this alternative, it is assumed that the states would not use ORV baits with the V-RG vaccine. Thus, there would be no potential for the V-RG virus to recombine with other viruses in the wild.

4.3.7 Potential for Aerially Dropped Baits to Strike and Injure People or Domestic Animals.

Under this alternative it is assumed there would be few or no ORV baits dropped from aircraft. Thus, there would be no potential for such baits to strike people or animals.

4.3.8 Cost of the Program in Comparison to Perceived Benefits.

4.3.8.1 Raccoon Rabies ORV Programs.

A live-capture-vaccinate-release program to control rabies in skunks and raccoons was implemented in Toronto in 1992 and cost an estimated $450 to $1,150/km^2 ($1,165 to $2,979/mi^2) in Canadian dollars (Rosatte et al. 1992). A more recent cost estimate of $500 Canadian/km^2 for a trap-vaccinate-release program in Ontario was presented by Rosatte et al. (2001). This analysis assumes the latest cost estimate in Rosatte et al. (2001) is the most applicable for comparing this alternative with ORV programs. At the current exchange rate of 0.76 U.S. dollars per Canadian dollar (OANDA 2004), the cost would be about $383/km^2 ($992/mi^2) in U.S. dollars. In contrast, Kemere et al. (2001) estimated the cost of establishing an ORV barrier of 102,650 km^2 (39,623 mi^2) from Lake Erie to the Gulf Coast as totaling about $121/km^2 ($313/mi^2) (costs included $1.30/bait, 75 baits/km^2, $8.62/km^2 for aerial distribution cost, and $15/km^2 for program evaluation). This is comparable to the reported cost of ORV in Ontario of $200 Canadian/km^2 ($152 U.S./km^2) (Rosatte et al. 2001). Therefore, it appears a live-capture-vaccinate-release alternative to manage raccoon rabies could cost about 2.5 times as much as the proposed action. Although a greater known proportion of targeted raccoon populations may be vaccinated by this approach (Rosatte et al. 2001), it is probably not necessary to achieve such greater vaccination rates because ORV programs have been successful in stopping or eliminating raccoon rabies outbreaks (see Section 1.1.5). Based on the analysis in Section 4.1.8, it appears benefits may not exceed costs under this alternative.

4.3.8.2 Gray Fox and Coyote Rabies ORV Programs in Texas.

Live-capture-vaccinate-release programs have not been attempted for these species. It is believed this alternative would be highly difficult to achieve with these species, particularly with coyotes. Although coyotes can be captured with certain devices such as leghold traps and snares, they are generally too wary to capture in cage traps (Baker and Timm 1998) and it is difficult to live capture and release a large enough proportion of fox or coyote populations with other traps such as leghold traps and snares (Rosatte et al. 1993; C. MacInnes, Ontario Ministry of Natural Resources pers. comm. 2001; personal observation of APHIS-WS personnel). The aerial ORV programs in Texas cost about $64 /km^2 ($166/mi^2), including the cost of aircraft, crew, ORV baits, ground crews, surveillance, and laboratory testing (derived from information from E. Oertli, TX Dept. of Health, pers. comm. 2001[5]). Based on the estimated costs of live-capture-vaccinate-release actions shown in Section 4.3.8.1, it is expected that this type of program would be much more expensive and time consuming to implement than ORV programs and would result in costs that exceed benefits.

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[5] Reported cost of $152.83 per sq mile for the 2001 TX ORV program bait drop from E. Oertli (pers. comm. 2001), which included cost of baits, aircraft use, pilot and 2 crew members, fuel, surveillance, laboratory titer costs, and laboratory biomarker analysis, but not salary/benefits of other involved personnel. Additional personnel totaled 64 over two 13-day bait drop periods (one each for gray fox and coyote ORV areas), for a total of 1,664 person-days. At an assumed daily cost of $150 per person-day for salaries/benefits, and total treated area of 7,700 sq km (20,000 sq mi), the cost per unit area for additional personnel is estimated to be $4.90/sq km ($12.80/sq mi). Total estimated cost per unit area was therefore about $64/sq mi ($166/sq mi).

4.3.9 Humaneness of Methods Used to Collect Wild Animal Specimens Critical for Timely Program Evaluation or to Reduce Local Populations of Target Species under State Contingency Plans.

Some persons would view live-capture-vaccinate-release programs as less humane than ORV programs, because large numbers of animals would experience the stress of being caught and handled to administer the vaccine. Others would view them as relatively humane compared to other types of rabies control efforts that involve lethal means to suppress target populations over broad geographic areas. Because it is believed this alternative could be as successful in stopping or preventing the spread of rabies as the proposed action, the amount of animal suffering due to contracting and dying from rabies would probably be similar to the proposed action.

4.4 Alternative 4 -- Provide Funds to Purchase and Distribute ORV Baits without Animal Specimen Collections or Lethal Removal of Animals under Contingency Plans.

Under this alternative, the states would have to fund collection of target species for monitoring and surveillance without APHIS-WS funds or personnel assistance. This would likely mean that less monitoring would be conducted. If insufficient monitoring and surveillance occurs along the leading edge of the advancing rabies strains, rabies managers would not be able to plan the most efficient and effective use of ORV baiting strategies to control the specific strains spread by wild carnivores. One possibility is that, without adequate surveillance, managers would have to resort to distributing ORV baits across more areas than necessary. The ability to stop or prevent the forward advance of specific rabies strains would likely be reduced, perhaps to the point that cooperative efforts fail.

4.4.1 Potential for Adverse Effects on People that Become Exposed to the Vaccine or the Baits.

4.4.1.1 Potential to Cause Rabies in Humans.

This alternative would present the same risk as the proposed action. Since the V-RG vaccine cannot cause rabies, there would be no potential for the ORV baits to cause rabies in humans under this or any other alternative or scenario involving the distribution of V-RG oral vaccine baits. However, there would be a greater risk of human rabies cases if the lack of federal assistance in monitoring and surveillance results in a reduction in the effectiveness of ORV programs.

4.4.1.2 Potential for Vaccinia Virus to Cause Disease in Humans.

This alternative would present the same risk as the proposed action. As shown by the analysis in Section 4.1.1.2, the risk of V-RG vaccine in ORV baits causing any health problems in humans is exceedingly low.

4.4.1.3 Potential to Cause Cancer (Oncogenicity).

This alternative would result in no probable risk of causing cancer in humans or animals, similar to the proposed action and other alternatives.

4.4.2 Potential for Adverse Effects on Target Wildlife Species Populations.

4.4.2.1 Effects of the ORV V-RG Vaccine on Raccoons, Gray Foxes, and Coyotes.

This alternative would result in the same risk as the proposed action, which is that adverse effects are highly unlikely. Positive effects on these species from protecting them against rabies would be similar to the proposed action. However, more animals are likely to die of rabies if the lack of federal assistance in monitoring and surveillance results in a reduction in the effectiveness of ORV programs.

4.4.2.2 Effects of Monitoring/Surveillance or Localized Population Reduction (Contingency Actions) on Raccoon Populations in Eastern States.

Under this alternative, APHIS-WS would not provide assistance in collecting animal specimens for monitoring purposes. The involved states could still conduct such collections; however, it is likely that fewer animals would be collected without APHIS-WS funds and assistance for that activity. Effects on raccoon populations would be exceedingly minor as supported by the analysis in Section 4.1.2.2.

4.4.2.3 Effects of Monitoring/Surveillance or Localized Population Reduction (Contingency Actions) on Gray Fox Populations in Texas.

Under this alternative, APHIS-WS would not provide assistance in collecting gray fox specimens for monitoring purposes in Texas. State agencies in Texas could still conduct such collections; however, it is likely that fewer animals would be collected without APHIS-WS funds and assistance for that activity. Effects on gray fox populations would be exceedingly minor as supported by the analysis in Section 4.1.2.3.

4.4.2.4 Effects of Monitoring/Surveillance or Localized Population Reduction (Contingency Actions) on Coyote Populations in Texas.

Under this alternative, APHIS-WS would not provide assistance in collecting coyote specimens for monitoring purposes in Texas. State agencies in Texas could still conduct such collections; however, it is likely that fewer animals would be collected without APHIS-WS funds and assistance for that activity. Effects on coyote populations would be exceedingly minor as supported by the analysis in Section 4.1.2.4.

4.4.3 Potential for Adverse Effects on Nontarget Wildlife Species, including Threatened or Endangered Species.

4.4.3.1 Effects of the RABORAL V-RG® Vaccine on Nontarget Wildlife, including Threatened or Endangered Species.

Effects of the V-RG vaccine on nontarget wildlife would be the same as under the proposed action. The analysis in Section 4.1.3.1 showed that adverse effects are unlikely. However, more animals are likely to die of rabies if the lack of federal assistance in monitoring and surveillance results in a reduction in the effectiveness of ORV programs.

4.4.3.2 Effects of Capture/Removal Methods (Used in Monitoring and Surveillance or to Reduce Local Populations of Target Species under State Contingency Plans) on Nontarget Species, including Threatened or Endangered Species.

Under this alternative, APHIS-WS would not continue to assist in monitoring activities or local depopulation activities that involve the use of lethal methods such as those discussed under the proposed action. Therefore, the potential for adverse effects on nontarget species would be even lower than under the proposed action. States would still likely implement monitoring and localized population reduction actions even without APHIS-WS, but such activities would likely be on a lesser scale without APHIS-WS funds. However, the analysis in Section 4.1.3.2 indicates effects on nontarget and T&E species would not be significant under the proposed action and would likely also not be significant even without APHIS-WS assistance.

4.4.4 Potential for Adverse Effects on Pet Dogs or Other Domestic Animals that Might Consume the Baits.

Under this alternative, the potential for adverse effects on domestic animals from ORV baits would be the same as the proposed action. Based on the analysis in Section 4.1.4, there is almost no potential for significant adverse effects on domestic animals because of ORV bait consumption under any scenario involving the distribution of ORV baits containing the V-RG vaccine. Stopping or preventing the spread of rabies would result in beneficial effects on domestic animals by reducing their likelihood of contracting rabies. However, more domestic animals are likely to die of rabies if the lack of federal assistance in monitoring and surveillance results in a reduction in the effectiveness of ORV programs.

4.4.5 Potential for the Recombined V-RG Virus to "Revert to Virulence" and Result in a Virus that could Cause Disease in Humans or Animals.

This potential would be the same as under the proposed action. The risk of adverse effects from the V-RG virus possibly reverting to a more virulent strain would be highly remote.

4.4.6 Potential for the V-RG Virus to Recombine with Other Viruses in the Wild to Form New Viruses that could Cause Disease in Humans or Animals.

This potential would be the same as under the proposed action. The risk of adverse effects from the V-RG virus possibly recombining with other viruses in the wild and resulting in significant adverse effects on human or animal health would be highly remote.

4.4.7 Potential for Aerially Dropped Baits to Strike and Injure People or Domestic Animals.

This potential would be the same as under the proposed action. The risk of striking and injuring people or domestic animals with baits is highly remote.

4.4.8 Cost of the Program in Comparison to Perceived Benefits.

4.4.8.1 Raccoon Rabies ORV Programs.

Costs of the federal portion of state-run ORV programs would be less since no APHIS-WS funds would be spent on animal collections to be used in monitoring. Benefits would probably be similar to the proposed action. Total costs, including the expenditure of federal and state funds, might be similar if states increased activities for monitoring because of the lack of APHIS-WS funds for this type of activity. Benefits would still probably exceed costs unless reduced monitoring/surveillance results in a reduction in the effectiveness of ORV programs.

4.4.8.2 Gray Fox and Coyote Rabies ORV Programs in Texas.

Costs of the federal portion of state-run ORV programs would be less since no APHIS-WS funds would be spent on animal collections to be used in monitoring. Benefits would probably be similar to the proposed action. Total costs, including the expenditure of federal and state funds, might be similar if states increased activities for monitoring because of the lack of APHIS-WS funds for this type of activity. Benefits would still probably exceed costs unless reduced monitoring/surveillance results in a reduction in the effectiveness of ORV programs.

4.4.9 Humaneness of Methods Used to Collect Wild Animal Specimens Critical for Timely Program Evaluation or to Reduce Local Populations of Target Species under State Contingency Plans.

Under this alternative, no APHIS-WS funds would be used to collect animal specimens or to conduct localized population reduction of target species using live-capture or lethal methods. States could still conduct these activities, but such efforts would probably be accomplished at a lesser scale without APHIS-WS assistance. This alternative would be viewed by some persons as more humane than the proposed action. Animal suffering due to rabies would probably be similar to the proposed action (i.e., greatly reduced). However, more animals are likely to suffer and die of rabies if reduced monitoring/surveillance results in a reduction in the effectiveness of ORV programs (see Section 4.2.9 for more detailed discussion).

4.5 CUMULATIVE IMPACTS

No significant cumulative environmental impacts are expected from any alternative, with the possible exception of Alternative 2 - No Action, which might lead to increased human exposures and domestic and wild animal rabies cases across much of the U.S. Although some persons will likely remain opposed to the use of recombinant vaccines or the use of the vaccinia pox virus as a component of ORV, and some will remain opposed to the lethal removal of raccoons, gray fox, or coyotes for monitoring purposes or for implementation of contingency rabies management plans, the analysis in this supplemental EA indicates that ORV use and such lethal removals will not result in significant risk of cumulative adverse impacts on the quality of the human environment.

4.6 SUMMARY OF IMPACTS OF ALTERNATIVES FOR EACH ISSUE

Table 4-1 presents a comparison of the alternatives and environmental consequences (impacts) on each of the issues identified for detailed analysis:

Table 4-1. Issues/Impacts/Alternatives/Comparison

Issues/Impacts	Alt. 1: Proposed Action (provide APHIS-WS funds for ORV and monitoring/ surveillance, potential localized target species population reduction)	Alt. 2: No Action (no APHIS-WS funds for rabies control provided)	Alt. 3: Live Capture/Vaccinate and Release	Alt. 4: Provide Funds for ORV without Lethal Animal Collections or Removals
Potential for adverse effects on people that become exposed to the vaccine or the baits.				
• Potential to cause rabies in humans.	No probable risk.	No probable risk from ORV use by states. Higher risk of human rabies cases if states are unable to stop the spread of rabies without federal assistance.	No probable risk.	No probable risk from ORV use; higher risk of human rabies cases if reduced monitoring and surveillance reduces effectiveness of ORV programs.
• Potential for vaccinia virus to cause disease in humans	Possible but risk is low; risk of significant adverse effects on individuals that experience vaccinia infections also is low.	Slightly lower risk than Alt. 1; states would likely still conduct ORV programs, but probably on a lesser scale without federal assistance.	No risk.	Possible but risk is low; risk of significant adverse effects on individuals that experience vaccinia infections also is low (same as Alt. 1).
• Potential to cause cancer (oncogenicity).	No probable risk.	No probable risk.	No probable risk.	No probable risk.

Table 4-1. Issues/Impacts/Alternatives/Comparison

Potential for adverse effects on target wildlife species populations.				
• Effects of the ORV V-RG vaccine on raccoons, gray foxes, and coyotes	No probable risk of adverse impacts.	No probable risk; states would likely still conduct ORV programs, but probably on a lesser scale without federal assistance.	No risk from V-RG vaccine.	No probable risk of adverse impact (same as Alt 1).
• Effects of monitoring and surveillance and localized population reduction actions on raccoon populations in eastern states.	Very low impact.	Slightly lower impact than Alt. 1; states would still conduct monitoring and surveillance and contingency actions, but these are likely to be on a lesser scale without federal assistance.	Very low impact (similar to Alt. 1).	Slightly lower impact than Alt. 1; states would still conduct monitoring and surveillance and contingency actions, but these are likely to be on a lesser scale without federal assistance.
• Effects of monitoring and surveillance and localized population reduction actions on gray fox populations in Texas.	Low impact.	Slightly lower impact than Alt. 1; the state would still conduct monitoring and surveillance and contingency actions, but these are likely to be on a lesser scale without federal assistance.	Low impact (similar to Alt. 1).	Lower impact than Alt. 1; the state would still conduct monitoring and surveillance and contingency actions, but these are likely to be on a lesser scale without federal assistance.
• Effects of monitoring and surveillance and localized population reduction actions on coyote populations in Texas.	Low impact.	Slightly lower impact than Alt. 1; the state would still conduct monitoring and surveillance and contingency actions, but these are likely to be on a lesser scale without federal assistance.	Low impact (similar to Alt. 1).	Lower impact than Alt. 1; the state would still conduct monitoring and surveillance and contingency actions, but these are likely to be on a lesser scale without federal assistance.
Potential for adverse effects on nontarget wildlife species, including threatened or endangered species.				
• Effects of the RABORAL V-RG® vaccine on nontarget wildlife including threatened or endangered species.	No effect on T&E species; No probable risk of adverse effects on other nontarget species.	No probable risk of adverse effects from ORV vaccine; but greater risk of adverse effects on these species from rabies.	No effect on T&E species; no risk of adverse effect on other species from ORV vaccine.	No effect on T&E species; No probable risk of adverse effects on other nontarget species (Same as Alt. 1); but greater risk of adverse effects on these species from rabies if reduced monitoring and surveillance reduces effectiveness of ORV programs.
• Effects of capture/removal methods (used in monitoring, surveillance, and localized population reduction) on nontarget species, including threatened or endangered species.	No effect on T&E species: Very low risk of adverse effects on other nontarget species.	Probably slightly less impact than Alt. 1.	Less impact than Alt. 1.	Less impact than Alt. 1; states would still conduct monitoring and surveillance and contingency actions, but these are likely to be on a lesser scale without federal assistance.

Table 4-1. **Issues/Impacts/Alternatives/Comparison**

Potential for adverse effects on pet dogs or other domestic animals that might consume the baits.	Low risk; Possible benefit from improving immunity to rabies.	Low risk; states would likely still conduct ORV programs. Increased risk of rabies for unvaccinated animals without federal assistance.	No risk of adverse effects from consuming ORV baits.	Low risk (similar risk as Alt. 1); increased risk of rabies for unvaccinated animals if reduced monitoring and surveillance reduces effectiveness of ORV programs.
Potential for the recombined V-RG virus to "revert to virulence" and result in a virus that could cause disease in humans or animals.	Very low risk.	Less risk than Alt. 1; states would likely still conduct ORV programs.	No risk.	Low risk (similar risk as Alt. 1).
Potential for the V-RG virus to recombine with other viruses in the wild to form new viruses that could cause disease in humans or animals.	Very low risk.	Less risk than Alt. 1; states would likely still conduct ORV programs.	No risk.	Low risk (similar risk as Alt. 1).
Potential for aerially dropped baits to strike and injure people or domestic animals.	Low risk.	Less risk than Alt. 1; states would likely still conduct ORV programs.	No risk.	Low risk (similar risk as Alt. 1).
Cost of the program in comparison to perceived benefits.	Expected benefits exceed costs of program.	Cost of adverse effects from rabies spread would be much greater than cost savings from not having federal assistance.	Expected benefits unlikely to exceed costs of program.	Expected benefits exceed costs of program (similar to Alt. 1); benefits may not exceed costs if reduced monitoring and surveillance reduces effectiveness of ORV programs.
Humaneness of methods used to collect wild animal specimens critical for timely program evaluation or to reduce local populations of target species under state contingency plans	Capture and handling of raccoons would be viewed by some persons as inhumane. Methods viewed as inhumane by some persons would be used to take gray fox and coyotes in Texas, but many animals saved from suffering and death due to rabies.	Probably less impact on this issue than Alt. 1; states likely to still conduct ORV programs with monitoring and surveillance and contingency plan implementation, but at a smaller scale without federal assistance; more animals likely to die of rabies if lack of federal assistance reduces effectiveness of ORV programs.	Capture and handling of target species would be viewed by some persons as inhumane. Fewer gray fox and coyotes would be taken in Texas using lethal methods, however, so this alternative would be viewed as more humane than Alt. 1.	This Alt. would be viewed as more humane than Alt. 1; states likely to still conduct monitoring and surveillance and contingency plan implementation, but at a smaller scale without federal assistance; more animals likely to die of rabies if reduced monitoring and surveillance reduces effectiveness of ORV programs.

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APPENDIX C
SPECIES LISTED AS THREATENED OR ENDANGERED UNDER THE ENDANGERED SPECIES ACT

Alabama -- 115 listings

Animals -- 97

Status	Listing
E	Acornshell, southern (*Epioblasma othcaloogensis*)
T(S/A)	Alligator, American (*Alligator mississippiensis*)
E	Bat, gray (*Myotis grisescens*)
E	Bat, Indiana (*Myotis sodalis*)
XN	Bean, Cumberland (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Villosa trabalis*)
XN	Blossom, tubercled (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma torulosa torulosa*)
E	Blossom, turgid (pearlymussel) Entire Range; Except where listed as Experimental Populations (*Epioblasma turgidula*)
XN	Blossom, turgid (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma turgidula*)
E	Blossom, yellow (pearlymussel) Entire Range; Except where listed as Experimental Populations (*Epioblasma florentina florentina*)
XN	Blossom, yellow (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma florentina florentina*)
E	Campeloma, slender (*Campeloma decampi*)
E	Catspaw (=purple cat's paw pearlymussel) Entire Range; Except where listed as Experimental Populations (*Epioblasma obliquata obliquata*)
XN	Catspaw (=purple cat's paw pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma obliquata obliquata*)
E	Cavefish, Alabama (*Speoplatyrhinus poulsoni*)
T	Chub, spotfin Entire (*Cyprinella monacha*)
XN	Clubshell AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Pleurobema clava*)
E	Clubshell, ovate (*Pleurobema perovatum*)
E	Clubshell, southern (*Pleurobema decisum*)
E	Combshell, Cumberlandian Entire Range; Except where listed as Experimental Populations (*Epioblasma brevidens*)
XN	Combshell, Cumberlandian AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma brevidens*)
E	Combshell, southern (*Epioblasma penita*)
E	Combshell, upland (*Epioblasma metastriata*)
E	Darter, boulder (*Etheostoma wapiti*)
T	Darter, goldline (*Percina aurolineata*)
T	Darter, slackwater (*Etheostoma boschungi*)
T	Darter, snail (*Percina tanasi*)
E	Darter, vermilion (*Etheostoma chermocki*)
E	Darter, watercress (*Etheostoma nuchale*)
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
T	Elimia, lacy (snail) (*Elimia crenatella*)
E	Fanshell (*Cyprogenia stegaria*)
T	Heelsplitter, Alabama (=inflated) (*Potamilus inflatus*)
E	Kidneyshell, triangular (*Ptychobranchus greeni*)
E	Lampmussel, Alabama Entire Range; Except where listed as Experimental Populations (*Lampsilis virescens*)
XN	Lampmussel, Alabama AL, Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Lampsilis virescens*)
E	Lilliput, pale (pearlymussel) (*Toxolasma cylindrellus*)
E	Lioplax, cylindrical (snail) (*Lioplax cyclostomaformis*)
XN	Mapleleaf, winged (mussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Quadrula fragosa*)
T	Moccasinshell, Alabama (*Medionidus acutissimus*)
E	Monkeyface, Cumberland (pearlymussel) Entire Range; Except where listed as Experimental Populations (*Quadrula intermedia*)
XN	Monkeyface, Cumberland (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Quadrula intermedia*)
E	Mouse, Alabama beach (*Peromyscus polionotus ammobates*)
E	Mouse, Perdido Key beach (*Peromyscus polionotus trissyllepsis*)
T	Mucket, orangenacre (*Lampsilis perovalis*)
E	Mucket, pink (pearlymussel) (*Lampsilis abrupta*)
E	Mussel, oyster Entire Range; Except where listed as Experimental Populations (*Epioblasma capsaeformis*)

XN	Mussel, oyster AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma capsaeformis*)
XN	Pearlymussel, birdwing AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Conradilla caelata*)
E	Pearlymussel, cracking Entire Range; Except where listed as Experimental Populations (*Hemistena lata*)
XN	Pearlymussel, cracking AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Hemistena lata*)
XN	Pearlymussel, dromedary AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Dromus dromas*)
E	Pebblesnail, flat (*Lepyrium showalteri*)
E	Pigtoe, dark (*Pleurobema furvum*)
E	Pigtoe, finerayed Entire Range; Except where listed as Experimental Populations (*Fusconaia cuneolus*)
XN	Pigtoe, finerayed AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Fusconaia cuneolus*)
E	Pigtoe, flat (*Pleurobema marshalli*)
E	Pigtoe, heavy (*Pleurobema taitianum*)
E	Pigtoe, rough (*Pleurobema plenum*)
E	Pigtoe, shiny Entire Range; Except where listed as Experimental Populations (*Fusconaia cor*)
XN	Pigtoe, shiny AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Fusconaia cor*)
E	Pigtoe, southern (*Pleurobema georgianum*)
E	Pimpleback, orangefoot (pearlymussel) (*Plethobasus cooperianus*)
T	Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)
T	Pocketbook, finelined (*Lampsilis altilis*)
E	Pocketbook, shinyrayed (*Lampsilis subangulata*)
E	Ring pink (mussel) (*Obovaria retusa*)
E	Riversnail, Anthony's Entire Range; Except where listed as Experimental Populations (*Athearnia anthonyi*)
XN	Riversnail, Anthony's AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Athearnia anthonyi*)
T	Rocksnail, painted (*Leptoxis taeniata*)
E	Rocksnail, plicate (*Leptoxis plicata*)
T	Rocksnail, round (*Leptoxis ampla*)
T	Salamander, Red Hills (*Phaeognathus hubrichti*)
T	Sculpin, pygmy (*Cottus paulus (=pygmaeus)*)
T	Sea turtle, green (except where endangered) (*Chelonia mydas*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
T	Shiner, blue (*Cyprinella caerulea*)
E	Shiner, Cahaba (*Notropis cahabae*)
E	Shiner, palezone (*Notropis albizonatus*)
E	Shrimp, Alabama cave (*Palaemonias alabamae*)
T	Slabshell, Chipola (*Elliptio chipolaensis*)
E	Snail, armored (*Pyrgulopsis (=Marstonia) pachyta*)
E	Snail, tulotoma (*Tulotoma magnifica*)
T	Snake, eastern indigo (*Drymarchon corais couperi*)
E	Stirrupshell (*Quadrula stapes*)
E	Stork, wood (AL, FL, GA, SC) (*Mycteria americana*)
E	Sturgeon, Alabama (*Scaphirhynchus suttkusi*)
T	Sturgeon, gulf (*Acipenser oxyrinchus desotoi*)
T	Tortoise, gopher (W of of Mobile/Tombigbee Rs.) (*Gopherus polyphemus*)
E	Turtle, Alabama red-belly (*Pseudemys alabamensis*)
T	Turtle, flattened musk (species range clarified) (*Sternotherus depressus*)
E	Wartyback, white (pearlymussel) (*Plethobasus cicatricosus*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, humpback (*Megaptera novaeangliae*)
E	Woodpecker, red-cockaded (*Picoides borealis*)

Plants -- 18

Status	**Listing**
T	Amphianthus, little (*Amphianthus pusillus*)
T	Potato-bean, Price's (*Apios priceana*)
T	Fern, American hart's-tongue (*Asplenium scolopendrium* var. *americanum*)
E	Leather flower, Morefield's (*Clematis morefieldii*)
E	Leather flower, Alabama (*Clematis socialis*)
E	Prairie-clover, leafy (*Dalea foliosa*)
T	Sunflower, Eggert's (*Helianthus eggertii*)
T	Bladderpod, lyrate (*Lesquerella lyrata*)
T	Button, Mohr's Barbara (*Marshallia mohrii*)
E	Harperella (*Ptilimnium nodosum*)

T Water-plantain, Kral's (*Sagittaria secundifolia*)
E Pitcher-plant, green (*Sarracenia oreophila*)
E Pitcher-plant, Alabama canebrake (*Sarracenia rubra alabamensis*)
E Chaffseed, American (*Schwalbea americana*)
E Pinkroot, gentian (*Spigelia gentianoides*)
T Fern, Alabama streak-sorus (*Thelypteris pilosa var. alabamensis*)
E Trillium, relict (*Trillium reliquum*)
E Grass, Tennessee yellow-eyed (*Xyris tennesseensis*)

Connecticut -- 19 listings
Animals – 17

Status	Listing
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
T	Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
T	Sea turtle, green (except where endangered) (*Chelonia mydas*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
E	Tern, roseate (northeast U.S. nesting pop.) (*Sterna dougallii dougallii*)
T	Tiger beetle, northeastern beach (*Cicindela dorsalis dorsalis*)
T	Tiger beetle, Puritan (*Cicindela puritana*)
T	Turtle, bog (=Muhlenberg) (northern) (*Clemmys muhlenbergii*)
E	Wedgemussel, dwarf (*Alasmidonta heterodon*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, right (*Balaena glacialis (incl. australis)*)
T	Wolf, gray Eastern Distinct Population Segment (*Canis lupus*)

Plants -- 2

Status	Listing
E	Gerardia, sandplain (*Agalinis acuta*)
T	Pogonia, small whorled (*Isotria medeoloides*)

Delaware -- 20 listings
Animals – 15

Status	Listing
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
T	Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
T	Sea turtle, green (except where endangered) (*Chelonia mydas*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
E	Squirrel, Delmarva Peninsula fox (except Sussex Co., DE) (*Sciurus niger cinereus*)
XN	Squirrel, Delmarva Peninsula fox [XN] (*Sciurus niger cinereus*)
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
T	Turtle, bog (=Muhlenberg) (northern) (*Clemmys muhlenbergii*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, humpback (*Megaptera novaeangliae*)
E	Whale, right (*Balaena glacialis (incl. australis)*)

Plants -- 5

Status	Listing
T	Amaranth, seabeach (*Amaranthus pumilus*)
T	Pink, swamp (*Helonias bullata*)
T	Pogonia, small whorled (*Isotria medeoloides*)
E	Dropwort, Canby's (*Oxypolis canbyi*)
T	Beaked-rush, Knieskern's (*Rhynchospora knieskernii*)

District of Columbia -- 3 listings
Animals – 3

Status	Listing
E	Amphipod, Hay's Spring (*Stygobromus hayi*)
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)

Plants – 0

APPENDIX C

Florida -- 111 listings

Animals – 57

Status	Listing
T(S/A)	Alligator, American (*Alligator mississippiensis*)
T	Bankclimber, purple (mussel) (*Elliptoideus sloatianus*)
E	Bat, gray (*Myotis grisescens*)
E	Butterfly, Schaus swallowtail (*Heraclides aristodemus ponceanus*)
T	Caracara, Audubon's crested (FL pop.) (*Polyborus plancus audubonii*)
XN	Crane, whooping U.S.A. (CO, ID, FL, NM, UT, and the western half of Wyoming) (*Grus americana*)
E	Crocodile, American (*Crocodylus acutus*)
E	Darter, Okaloosa (*Etheostoma okaloosae*)
E	Deer, key (*Odocoileus virginianus clavium*)
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
T	Jay, Florida scrub (*Aphelocoma coerulescens*)
E	Kite, Everglade snail (FL pop.) (*Rostrhamus sociabilis plumbeus*)
E	Manatee, West Indian (*Trichechus manatus*)
E	Moccasinshell, Gulf (*Medionidus penicillatus*)
E	Moccasinshell, Ochlockonee (*Medionidus simpsonianus*)
E	Mouse, Anastasia Island beach (*Peromyscus polionotus phasma*)
E	Mouse, Choctawhatchee beach (*Peromyscus polionotus allophrys*)
E	Mouse, Key Largo cotton (*Peromyscus gossypinus allapaticola*)
E	Mouse, Perdido Key beach (*Peromyscus polionotus trissyllepsis*)
T	Mouse, southeastern beach (*Peromyscus polionotus niveiventris*)
E	Mouse, St. Andrew beach (*Peromyscus polionotus peninsularis*)
E	Panther, Florida (*Puma (=Felis) concolor coryi*)
E	Pigtoe, oval (*Pleurobema pyriforme*)
T	Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)
E	Pocketbook, shinyrayed (*Lampsilis subangulata*)
T(S/A)	Puma (=mountain lion) (FL) (*Puma (=Felis) concolor (all subsp. except coryi)*)
E	Rabbit, Lower Keys marsh (*Sylvilagus palustris hefneri*)
E	Rice rat (lower FL Keys) (*Oryzomys palustris natator*)
T	Salamander, flatwoods (*Ambystoma cingulatum*)
E	Sea turtle, green (FL, Mexico nesting pops.) (*Chelonia mydas*)
T	Sea turtle, green (except where endangered) (*Chelonia mydas*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
E	Seal, Caribbean monk (*Monachus tropicalis*)
T	Shrimp, Squirrel Chimney Cave (*Palaemonetes cummingi*)
T	Skink, bluetail mole (*Eumeces egregius lividus*)
T	Skink, sand (*Neoseps reynoldsi*)
T	Slabshell, Chipola (*Elliptio chipolaensis*)
T	Snail, Stock Island tree (*Orthalicus reses (not incl. nesodryas)*)
T	Snake, Atlantic salt marsh (*Nerodia clarkii taeniata*)
T	Snake, eastern indigo (*Drymarchon corais couperi*)
E	Sparrow, Cape Sable seaside (*Ammodramus maritimus mirabilis*)
E	Sparrow, Florida grasshopper (*Ammodramus savannarum floridanus*)
E	Stork, wood (AL, FL, GA, SC) (*Mycteria americana*)
T	Sturgeon, gulf (*Acipenser oxyrinchus desotoi*)
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
T	Tern, roseate (Western Hemisphere except NE U.S.) (*Sterna dougallii dougallii*)
E	Three-ridge, fat (mussel) (*Amblema neislerii*)
E	Vole, Florida salt marsh (*Microtus pennsylvanicus dukecampbelli*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, humpback (*Megaptera novaeangliae*)
E	Whale, right (*Balaena glacialis (incl. australis)*)
E	Wolf, red (except where XN) (*Canis rufus*)
E	Woodpecker, red-cockaded (*Picoides borealis*)
E	Woodrat, Key Largo (*Neotoma floridana smalli*)

Plants -- 54

Status	Listing
E	Lead-plant, Crenulate (*Amorpha crenulata*)
E	Pawpaw, four-petal (*Asimina tetramera*)
T	Bonamia, Florida (*Bonamia grandiflora*)
E	Bellflower, Brooksville (*Campanula robinsiae*)
E	Prickly-apple, fragrant (*Cereus eriophorus var. fragrans*)
E	Spurge, deltoid (*Chamaesyce deltoidea ssp. deltoidea*)
T	Spurge, Garber's (*Chamaesyce garberi*)
E	Fringe-tree, pygmy (*Chionanthus pygmaeus*)

E Aster, Florida golden (*Chrysopsis floridana*)
E Cladonia, Florida perforate (*Cladonia perforata*)
T Pigeon wings (*Clitoria fragrans*)
E Rosemary, short-leaved (*Conradina brevifolia*)
E Rosemary, Etonia (*Conradina etonia*)
E Rosemary, Apalachicola (*Conradina glabra*)
E Harebells, Avon Park (*Crotalaria avonensis*)
E Gourd, Okeechobee (*Cucurbita okeechobeensis ssp. okeechobeensis*)
E Pawpaw, beautiful (*Deeringothamnus pulchellus*)
E Pawpaw, Rugel's (*Deeringothamnus rugelii*)
E Mint, Garrett's (*Dicerandra christmanii*)
E Mint, longspurred (*Dicerandra cornutissima*)
E Mint, scrub (*Dicerandra frutescens*)
E Mint, Lakela's (*Dicerandra immaculata*)
T Buckwheat, scrub (*Eriogonum longifolium var. gnaphalifolium*)
E Snakeroot (*Eryngium cuneifolium*)
T Spurge, telephus (*Euphorbia telephioides*)
E Milkpea, Small's (*Galactia smallii*)
T Seagrass, Johnson's (*Halophila johnsonii*)
E Beauty, Harper's (*Harperocallis flava*)
E Hypericum, highlands scrub (*Hypericum cumulicola*)
E Jacquemontia, beach (*Jacquemontia reclinata*)
E Water-willow, Cooley's (*Justicia cooleyi*)
E Blazingstar, scrub (*Liatris ohlingerae*)
E Lupine, scrub (*Lupinus aridorum*)
T Birds-in-a-nest, white (*Macbridea alba*)
E Beargrass, Britton's (*Nolina brittoniana*)
T Whitlow-wort, papery (*Paronychia chartacea*)
E Cactus, Key tree (*Pilosocereus robinii*)
T Butterwort, Godfrey's (*Pinguicula ionantha*)
E Polygala, Lewton's (*Polygala lewtonii*)
E Polygala, tiny (*Polygala smallii*)
E Wireweed (*Polygonella basiramia*)
E Sandlace (*Polygonella myriophylla*)
E Plum, scrub (*Prunus geniculata*)
E Rhododendron, Chapman (*Rhododendron chapmanii*)
T Gooseberry, Miccosukee (*Ribes echinellum*)
E Chaffseed, American (*Schwalbea americana*)
T Skullcap, Florida (*Scutellaria floridana*)
E Campion, fringed (*Silene polypetala*)
E Pinkroot, gentian (*Spigelia gentianoides*)
E Meadowrue, Cooley's (*Thalictrum cooleyi*)
E Torreya, Florida (*Torreya taxifolia*)
E Warea, wide-leaf (*Warea amplexifolia*)
E Mustard, Carter's (*Warea carteri*)
E Ziziphus, Florida (*Ziziphus celata*)

Georgia -- 66 listings
Animals – 43

Status	Listing
E	Acornshell, southern (*Epioblasma othcaloogensis*)
T(S/A)	Alligator, American (*Alligator mississippiensis*)
T	Bankclimber, purple (mussel) (*Elliptoideus sloatianus*)
E	Bat, gray (*Myotis grisescens*)
E	Bat, Indiana (*Myotis sodalis*)
E	Clubshell, southern (*Pleurobema decisum*)
E	Combshell, upland (*Epioblasma metastriata*)
E	Darter, amber (*Percina antesella*)
T	Darter, Cherokee (*Etheostoma scotti*)
E	Darter, Etowah (*Etheostoma etowahae*)
T	Darter, goldline (*Percina aurolineata*)
T	Darter, snail (*Percina tanasi*)
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
E	Kidneyshell, triangular (*Ptychobranchus greenii*)
E	Logperch, Conasauga (*Percina jenkinsi*)
E	Manatee, West Indian (*Trichechus manatus*)
T	Moccasinshell, Alabama (*Medionidus acutissimus*)
E	Moccasinshell, Coosa (*Medionidus parvulus*)
E	Moccasinshell, Gulf (*Medionidus penicillatus*)
E	Moccasinshell, Ochlockonee (*Medionidus simpsonianus*)

XN Mussel, oyster AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma capsaeformis*)
E Pigtoe, oval (*Pleurobema pyriforme*)
E Pigtoe, southern (*Pleurobema georgianum*)
T Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)
T Pocketbook, finelined (*Lampsilis altilis*)
E Pocketbook, shinyrayed (*Lampsilis subangulata*)
XN Riversnail, Anthony's AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Athearnia anthonyi*)
T Salamander, flatwoods (*Ambystoma cingulatum*)
T Sea turtle, green (except where endangered) (*Chelonia mydas*)
E Sea turtle, hawksbill (*Eretmochelys imbricata*)
E Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E Sea turtle, leatherback (*Dermochelys coriacea*)
T Sea turtle, loggerhead (*Caretta caretta*)
T Shiner, blue (*Cyprinella caerulea*)
T Snake, eastern indigo (*Drymarchon corais couperi*)
E Stork, wood (AL, FL, GA, SC) (*Mycteria americana*)
E Sturgeon, shortnose (*Acipenser brevirostrum*)
T Tern, roseate (Western Hemisphere except NE U.S.) (*Sterna dougallii dougallii*)
T(S/A) Turtle, bog (=Muhlenberg) (southern) (*Clemmys muhlenbergii*)
E Whale, finback (*Balaenoptera physalus*)
E Whale, humpback (*Megaptera novaeangliae*)
E Whale, right (*Balaena glacialis (incl. australis)*)
E Woodpecker, red-cockaded (*Picoides borealis*)

Plants -- 23

Status Listing

T Amphianthus, little (*Amphianthus pusillus*)
E Rattleweed, hairy (*Baptisia arachnifera*)
E Leather flower, Alabama (*Clematis socialis*)
E Coneflower, smooth (*Echinacea laevigata*)
T Pink, swamp (*Helonias bullata*)
E Quillwort, black spored (*Isoetes melanospora*)
E Quillwort, mat-forming (*Isoetes tegetiformans*)
T Pogonia, small whorled (*Isotria medeoloides*)
E Pondberry (*Lindera melissifolia*)
T Button, Mohr's Barbara (*Marshallia mohrii*)
E Dropwort, Canby's (*Oxypolis canbyi*)
E Harperella (*Ptilimnium nodosum*)
E Sumac, Michaux's (*Rhus michauxii*)
T Water-plantain, Kral's (*Sagittaria secundifolia*)
E Pitcher-plant, green (*Sarracenia oreophila*)
E Chaffseed, American (*Schwalbea americana*)
T Skullcap, large-flowered (*Scutellaria montana*)
E Campion, fringed (*Silene polypetala*)
T Spiraea, Virginia (*Spiraea virginiana*)
E Torreya, Florida (*Torreya taxifolia*)
E Trillium, persistent (*Trillium persistens*)
E Trillium, relict (*Trillium reliquum*)
E Grass, Tennessee yellow-eyed (*Xyris tennesseensis*)

Indiana -- 29 listings

Animals -- 25

Status Listing

E Bat, gray (*Myotis grisescens*)
E Bat, Indiana (*Myotis sodalis*)
E Blossom, tubercled (pearlymussel) Entire Range; Except where listed as Experimental Populations (*Epioblasma torulosa torulosa*)
XN Blossom, tubercled (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma torulosa torulosa*)
E Butterfly, Karner blue (*Lycaeides melissa samuelis*)
E Butterfly, Mitchell's satyr (*Neonympha mitchellii mitchellii*)
XN Catspaw (=purple cat's paw pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma obliquata obliquata*)
E Catspaw, white (pearlymussel) (*Epioblasma obliquata perobliqua*)
E Clubshell Entire Range; Except where listed as Experimental Populations (*Pleurobema clava*)
T Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
E Fanshell (*Cyprogenia stegaria*)
E Mucket, pink (pearlymussel) (*Lampsilis abrupta*)
E Pearlymussel, cracking Entire Range; Except where listed as Experimental Populations (*Hemistena lata*)

E Pigtoe, rough (*Pleurobema plenum*)
E Pimpleback, orangefoot (pearlymussel) (*Plethobasus cooperianus*)
E Plover, piping (Great Lakes watershed) (*Charadrius melodus*)
T Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)
E Pocketbook, fat (*Potamilus capax*)
E Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
E Riffleshell, northern (*Epioblasma torulosa rangiana*)
E Ring pink (mussel) (*Obovaria retusa*)
T Snake, copperbelly water (MI, OH, IN N of 400 N. Lat.) (*Nerodia erythrogaster neglecta*)
E Tern least (interior pop.) (*Sterna antillarum*)
E Wartyback, white (pearlymussel) (*Plethobasus cicatricosus*)
T Wolf, gray Eastern Distinct Population Segment (*Canis lupus*)

Plants -- 4

Status	Listing
T	Milkweed, Mead's (*Asclepias meadii*)
T	Thistle, Pitcher's (*Cirsium pitcheri*)
E	Goldenrod, Short's (*Solidago shortii*)
E	Clover, running buffalo (*Trifolium stoloniferum*)

Kentucky -- 47 listings

Animals -- 38

Status	Listing
E	Bat, gray (*Myotis grisescens*)
E	Bat, Indiana (*Myotis sodalis*)
E	Bat, Virginia big-eared (*Corynorhinus (=Plecotus) townsendii virginianus*)
E	Bean, Cumberland (pearlymussel) Entire Range; Except where listed as Experimental Populations (*Villosa trabalis*)
XN	Bean, Cumberland (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Villosa trabalis*)
E	Blossom, tubercled (pearlymussel) Entire Range; Except where listed as Experimental Populations (*Epioblasma torulosa torulosa*)
XN	Blossom, tubercled (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma torulosa torulosa*)
E	Catspaw (=purple cat's paw pearlymussel) Entire Range; Except where listed as Experimental Populations (*Epioblasma obliquata obliquata*)
XN	Catspaw (=purple cat's paw pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma obliquata obliquata*)
E	Clubshell Entire Range; Except where listed as Experimental Populations (*Pleurobema clava*)
E	Combshell, Cumberlandian Entire Range; Except where listed as Experimental Populations (*Epioblasma brevidens*)
XN	Combshell, Cumberlandian AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma brevidens*)
T	Dace, blackside (*Phoxinus cumberlandensis*)
E	Darter, duskytail Entire (*Etheostoma percnurum*)
E	Darter, relict (*Etheostoma chienense*)
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
E	Elktoe, Cumberland (*Alasmidonta atropurpurea*)
E	Fanshell (*Cyprogenia stegaria*)
E	Mapleleaf, winged (mussel) Entire; except where listed as experimental populations (*Quadrula fragosa*)
E	Mucket, pink (pearlymussel) (*Lampsilis abrupta*)
E	Mussel, oyster Entire Range; Except where listed as Experimental Populations (*Epioblasma capsaeformis*)
XN	Mussel, oyster AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma capsaeformis*)
E	Pearlymussel, cracking Entire Range; Except where listed as Experimental Populations (*Hemistena lata*)
E	Pearlymussel, dromedary Entire Range; Except where listed as Experimental Populations (*Dromus dromas*)
E	Pearlymussel, littlewing (*Pegias fabula*)
E	Pigtoe, rough (*Pleurobema plenum*)
E	Pimpleback, orangefoot (pearlymussel) (*Plethobasus cooperianus*)
T	Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)
E	Pocketbook, fat (*Potamilus capax*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
E	Riffleshell, northern (*Epioblasma torulosa rangiana*)
E	Riffleshell, tan (*Epioblasma florentina walkeri (=E. walkeri)*)
E	Ring pink (mussel) (*Obovaria retusa*)
E	Shiner, palezone (*Notropis albizonatus*)
E	Shrimp, Kentucky cave (*Palaemonias ganteri*)
E	Sturgeon, pallid (*Scaphirhynchus albus*)
E	Tern, least (interior pop.) (*Sterna antillarum*)
E	Wartyback, white (pearlymussel) (*Plethobasus cicatricosus*)

Plants -- 9

Status	Listing
T	Potato-bean, Price's (*Apios priceana*)

E Rock-cress, Braun's (*Arabis perstellata*)
E Sandwort, Cumberland (*Arenaria cumberlandensis*)
T Rosemary, Cumberland (*Conradina verticillata*)
T Sunflower, Eggert's (*Helianthus eggertii*)
T Goldenrod, white-haired (*Solidago albopilosa*)
E Goldenrod, Short's (*Solidago shortii*)
T Spiraea, Virginia (*Spiraea virginiana*)
E Clover, running buffalo (*Trifolium stoloniferum*)

Louisiana -- 26 listings
Animals -- 23

Status	Listing
T(S/A)	Alligator, American (*Alligator mississippiensis*)
T(S/A)	Bear, American black (County range of LA b.bear) (*Ursus americanus*)
T	Bear, Louisiana black (*Ursus americanus luteolus*)
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
T	Heelsplitter, Alabama (=inflated) (*Potamilus inflatus*)
E	Mucket, pink (pearlymussel) (*Lampsilis abrupta*)
T	Pearlshell, Louisiana (*Margaritifera hembeli*)
E	Pelican, brown (except U.S. Atlantic coast, FL, AL) (*Pelecanus occidentalis*)
T	Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)
T	Sea turtle, green (except where endangered) (*Chelonia mydas*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
T	Sturgeon, gulf (*Acipenser oxyrinchus desotoi*)
E	Sturgeon, pallid (*Scaphirhynchus albus*)
E	Tern, least (interior pop.) (*Sterna antillarum*)
T	Tortoise, gopher (W of of Mobile/Tombigbee Rs.) (*Gopherus polyphemus*)
T	Turtle, ringed map (*Graptemys oculifera*)
E	Vireo, black-capped (*Vireo atricapilla*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, humpback (*Megaptera novaeangliae*)
E	Woodpecker, red-cockaded (*Picoides borealis*)

Plants -- 3

Status	Listing
T	*Geocarpon minimum* (No common name)
E	Quillwort, Louisiana (*Isoetes louisianensis*)
E	Chaffseed, American (*Schwalbea americana*)

Maine -- 15 listings
Animals -- 12

Status	Listing
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
T	Lynx, Canada (*Lynx canadensis*)
T	Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
E	Salmon, Atlantic Gulf of Maine Atlantic Salmon DPS (*Salmo salar*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
E	Tern, roseate (northeast U.S. nesting pop.) (*Sterna dougallii dougallii*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, humpback (*Megaptera novaeangliae*)
E	Whale, right (*Balaena glacialis (incl. australis)*)
T	Wolf, gray Eastern Distinct Population Segment (*Canis lupus*)

Plants -- 3

Status	Listing
T	Pogonia, small whorled (*Isotria medeoloides*)
E	Lousewort, Furbish (*Pedicularis furbishiae*)
T	Orchid, eastern prairie fringed (*Platanthera leucophaea*)

Maryland -- 26 listings
Animals -- 19

Status	Listing
E	Bat, Indiana (*Myotis sodalis*)
E	Darter, Maryland (*Etheostoma sellare*)
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
T	Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)

T Sea turtle, green (except where endangered) (*Chelonia mydas*)
E Sea turtle, hawksbill (*Eretmochelys imbricata*)
E Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E Sea turtle, leatherback (*Dermochelys coriacea*)
T Sea turtle, loggerhead (*Caretta caretta*)
E Squirrel, Delmarva Peninsula fox (except Sussex Co., DE) (*Sciurus niger cinereus*)
E Sturgeon, shortnose (*Acipenser brevirostrum*)
T Tiger beetle, northeastern beach (*Cicindela dorsalis dorsalis*)
T Tiger beetle, Puritan (*Cicindela puritana*)
T Turtle, bog (=Muhlenberg) (northern) (*Clemmys muhlenbergii*)
E Wedgemussel, dwarf (*Alasmidonta heterodon*)
E Whale, finback (*Balaenoptera physalus*)
E Whale, humpback (*Megaptera novaeangliae*)
E Whale, right (*Balaena glacialis (incl. australis)*)

Plants – 7

Status	Listing
T	Joint-vetch, sensitive (*Aeschynomene virginica*)
E	Gerardia, sandplain (*Agalinis acuta*)
T	Amaranth, seabeach (*Amaranthus pumilus*)
T	Pink, swamp (*Helonias bullata*)
E	Dropwort, Canby's (*Oxypolis canbyi*)
E	Harperella (*Ptilimnium nodosum*)
E	Bulrush, Northeastern (*Scirpus ancistrochaetus*)

Massachusetts -- 24 listings

Animals – 21

Status	Listing
E	Beetle, American burying (*Nicrophorus americanus*)
E	Cooter (=turtle), northern redbelly (=Plymouth) (*Pseudemys rubriventris bangsi*)
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
T	Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
E	Tern, roseate (northeast U.S. nesting pop.) (*Sterna dougallii dougallii*)
T	Tiger beetle, northeastern beach (*Cicindela dorsalis dorsalis*)
T	Tiger beetle, Puritan (*Cicindela puritana*)
T	Turtle, bog (=Muhlenberg) (northern) (*Clemmys muhlenbergii*)
E	Wedgemussel, dwarf (*Alasmidonta heterodon*)
E	Whale, blue (*Balaenoptera musculus*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, humpback (*Megaptera novaeangliae*)
E	Whale, right (*Balaena glacialis (incl. australis)*)
E	Whale, Sei (*Balaenoptera borealis*)
T	Wolf, gray Eastern Distinct Population Segment (*Canis lupus*)

Plants -- 3

Status	Listing
E	Gerardia, sandplain (*Agalinis acuta*)
T	Pogonia, small whorled (*Isotria medeoloides*)
E	Bulrush, Northeastern (*Scirpus ancistrochaetus*)

Michigan -- 21 listings

Animals – 13

Status	Listing
E	Bat, Indiana (*Myotis sodalis*)
E	Beetle, American burying (*Nicrophorus americanus*)
E	Beetle, Hungerford's crawling water (*Brychius hungerfordi*)
E	Butterfly, Karner blue (*Lycaeides melissa samuelis*)
E	Butterfly, Mitchell's satyr (*Neonympha mitchellii mitchellii*)
E	Clubshell Entire Range; Except where listed as Experimental Populations (*Pleurobema clava*)
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
E	Plover, piping (Great Lakes watershed) (*Charadrius melodus*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
E	Riffleshell, northern (*Epioblasma torulosa rangiana*)
T	Snake, copperbelly water (MI, OH, IN N of 400 N. Lat.) (*Nerodia erythrogaster neglecta*)
E	Warbler (=wood), Kirtland's (*Dendroica kirtlandii*)
T	Wolf, gray Eastern Distinct Population Segment (*Canis lupus*)

Plants -- 8

Status	Listing
T	Fern, American hart's-tongue (Asplenium scolopendrium var. americanum)
T	Thistle, Pitcher's (Cirsium pitcheri)
T	Daisy, lakeside (Hymenoxys herbacea)
T	Iris, dwarf lake (Iris lacustris)
T	Pogonia, small whorled (Isotria medeoloides)
E	Monkey-flower, Michigan (Mimulus glabratus var. michiganensis)
T	Orchid, eastern prairie fringed (Platanthera leucophaea)
T	Goldenrod, Houghton's (Solidago houghtonii)

Mississippi -- 38 listings

Animals -- 34

Status	Listing
T(S/A)	Alligator, American (Alligator mississippiensis)
E	Bat, Indiana (Myotis sodalis)
T(S/A)	Bear, American black (County range of LA.b.bear) (Ursus americanus)
T	Bear, Louisiana black (Ursus americanus luteolus)
E	Clubshell, black (Pleurobema curtum)
E	Clubshell, ovate (Pleurobema perovatum)
E	Clubshell, southern (Pleurobema decisum)
E	Combshell, southern (Epioblasma penita)
E	Crane, Mississippi sandhill (Grus canadensis pulla)
T	Darter, bayou (Etheostoma rubrum)
T	Eagle, bald (lower 48 States) (Haliaeetus leucocephalus)
E	Frog, Mississippi gopher Wherever found west of Mobile and Tombigbee Rivers in AL, MS, and LA. (Rana capito sevosa)
T	Moccasinshell, Alabama (Medionidus acutissimus)
T	Mucket, orangenacre (Lampsilis perovalis)
E	Pelican, brown (except U.S. Atlantic coast, FL, AL) (Pelecanus occidentalis)
E	Pigtoe, flat (Pleurobema marshalli)
T	Plover, piping (except Great Lakes watershed) (Charadrius melodus)
E	Pocketbook, fat (Potamilus capax)
T	Sea turtle, green (except where endangered) (Chelonia mydas)
E	Sea turtle, hawksbill (Eretmochelys imbricata)
E	Sea turtle, Kemp's ridley (Lepidochelys kempii)
E	Sea turtle, leatherback (Dermochelys coriacea)
T	Sea turtle, loggerhead (Caretta caretta)
E	Stirrupshell (Quadrula stapes)
E	Sturgeon, Alabama (Scaphirhynchus suttkusi)
T	Sturgeon, gulf (Acipenser oxyrinchus desotoi)
E	Sturgeon, pallid (Scaphirhynchus albus)
E	Tern, least (interior pop.) (Sterna antillarum)
T	Tortoise, gopher (W of of Mobile/Tombigbee Rs.) (Gopherus polyphemus)
T	Turtle, ringed map (Graptemys oculifera)
T	Turtle, yellow-blotched map (Graptemys flavimaculata)
E	Whale, finback (Balaenoptera physalus)
E	Whale, humpback (Megaptera novaeangliae)
E	Woodpecker, red-cockaded (Picoides borealis)

Plants -- 4

Status	Listing
T	Potato-bean, Price's (Apios priceana)
E	Quillwort, Louisiana (Isoetes louisianensis)
E	Pondberry (Lindera melissifolia)
E	Chaffseed, American (Schwalbea americana)

New Hampshire -- 12 listings

Animals -- 9

Status	Listing
E	Butterfly, Karner blue (Lycaeides melissa samuelis)
T	Eagle, bald (lower 48 States) (Haliaeetus leucocephalus)
T	Plover, piping (except Great Lakes watershed) (Charadrius melodus)
E	Puma (=cougar), eastern (Puma (=Felis) concolor couguar)
E	Sea turtle, leatherback (Dermochelys coriacea)
T	Tiger beetle, Puritan (Cicindela puritana)
E	Wedgemussel, dwarf (Alasmidonta heterodon)
E	Whale, finback (Balaenoptera physalus)
T	Wolf, gray Eastern Distinct Population Segment (Canis lupus)

Plants -- 3

Status	Listing
E	Milk-vetch, Jesup's (Astragalus robbinsii var. jesupi)

T Pogonia, small whorled (*Isotria medeoloides*)
E Bulrush, Northeastern (*Scirpus ancistrochaetus*)

New Jersey -- 23 listings
Animals -- 17

Status	Listing
E	Bat, Indiana (*Myotis sodalis*)
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
T	Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
E	Tern, roseate (northeast U.S. nesting pop.) (*Sterna dougallii dougallii*)
T	Tiger beetle, northeastern beach (*Cicindela dorsalis dorsalis*)
T	Turtle, bog (=Muhlenberg) (northern) (*Clemmys muhlenbergii*)
E	Wedgemussel, dwarf (*Alasmidonta heterodon*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, humpback (*Megaptera novaeangliae*)
E	Whale, right (*Balaena glacialis (incl. australis)*)
T	Wolf, gray Eastern Distinct Population Segment (*Canis lupus*)

Plants -- 6

Status	Listing
T	Joint-vetch, sensitive (*Aeschynomene virginica*)
T	Amaranth, seabeach (*Amaranthus pumilus*)
T	Pink, swamp (*Helonias bullata*)
T	Pogonia, small whorled (*Isotria medeoloides*)
T	Beaked-rush, Knieskern's (*Rhynchospora knieskernii*)
E	Chaffseed, American (*Schwalbea americana*)

New York -- 26 listings
Animals -- 20

Status	Listing
E	Bat, Indiana (*Myotis sodalis*)
E	Butterfly, Karner blue (*Lycaeides melissa samuelis*)
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
E	Plover, piping (Great Lakes watershed) (*Charadrius melodus*)
T	Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
T	Sea turtle, green (except where endangered) (*Chelonia mydas*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
T	Snail, Chittenango ovate amber (*Succinea chittenangoensis*)
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
E	Tern, roseate (northeast U.S. nesting pop.) (*Sterna dougallii dougallii*)
T	Turtle, bog (=Muhlenberg) (northern) (*Clemmys muhlenbergii*)
E	Wedgemussel, dwarf (*Alasmidonta heterodon*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, humpback (*Megaptera novaeangliae*)
E	Whale, right (*Balaena glacialis (incl. australis)*)
T	Wolf, gray Eastern Distinct Population Segment (*Canis lupus*)

Plants -- 6

Status	Listing
T	Monkshood, northern wild (*Aconitum noveboracense*)
E	Gerardia, sandplain (*Agalinis acuta*)
T	Amaranth, seabeach (*Amaranthus pumilus*)
T	Fern, American hart's-tongue (*Asplenium scolopendrium var. americanum*)
T	Roseroot, Leedy's (*Sedum integrifolium ssp. leedyi*)
T	Goldenrod, Houghton's (*Solidago houghtonii*)

North Carolina -- 63 listings
Animals -- 36

Status	Listing
T(S/A)	Alligator, American (*Alligator mississippiensis*)
E	Bat, Indiana (*Myotis sodalis*)
E	Bat, Virginia big-eared (*Corynorhinus (=Plecotus) townsendii virginianus*)

E	Butterfly, Saint Francis' satyr (*Neonympha mitchellii francisci*)
T	Chub, spotfin Entire (*Cyprinella monacha*)
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
E	Elktoe, Appalachian (*Alasmidonta raveneliana*)
E	Heelsplitter, Carolina (*Lasmigona decorata*)
XN	Mussel, oyster AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma capsaeformis*)
E	Pearlymussel, littlewing (*Pegias fabula*)
T	Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
T	Sea turtle, green (except where endangered) (*Chelonia mydas*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
E	Shiner, Cape Fear (*Notropis mekistocholas*)
T	Silverside, Waccamaw (*Menidia extensa*)
T	Snail, noonday (*Mesodon clarki nantahala*)
E	Spider, spruce-fir moss (*Microhexura montivaga*)
E	Spinymussel, James (*Pleurobema collina*)
E	Spinymussel, Tar River (*Elliptio steinstansana*)
E	Squirrel, Carolina northern flying (*Glaucomys sabrinus coloratus*)
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
E	Tern, roseate (northeast U.S. nesting pop.) (*Sterna dougallii dougallii*)
T	Tern, roseate (Western Hemisphere except NE U.S.) (*Sterna dougallii dougallii*)
T(S/A)	Turtle, bog (=Muhlenberg) (southern) (*Clemmys muhlenbergii*)
E	Wedgemussel, dwarf (*Alasmidonta heterodon*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, humpback (*Megaptera novaeangliae*)
E	Whale, right (*Balaena glacialis (incl. australis)*)
E	Whale, sperm (*Physeter catodon (=macrocephalus)*)
E	Wolf, red (except where XN) (*Canis rufus*)
XN	Wolf, red [XN] (*Canis rufus*)
E	Woodpecker, red-cockaded (*Picoides borealis*)

Plants -- 27

Status	Listing
T	Joint-vetch, sensitive (*Aeschynomene virginica*)
T	Amaranth, seabeach (*Amaranthus pumilus*)
E	Bittercress, small-anthered (*Cardamine micranthera*)
E	Sedge, golden (*Carex lutea*)
E	Coneflower, smooth (*Echinacea laevigata*)
E	Avens, spreading (*Geum radiatum*)
E	Lichen, rock gnome (*Gymnoderma lineare*)
E	Bluet, Roan Mountain (*Hedyotis purpurea* var. *montana*)
E	Sunflower, Schweinitz's (*Helianthus schweinitzii*)
T	Pink, swamp (*Helonias bullata*)
T	Heartleaf, dwarf-flowered (*Hexastylis naniflora*)
T	Heather, mountain golden (*Hudsonia montana*)
T	Pogonia, small whorled (*Isotria medeoloides*)
T	Blazingstar, Heller's (*Liatris helleri*)
E	Pondberry (*Lindera melissifolia*)
E	Loosestrife, rough-leaved (*Lysimachia asperulaefolia*)
E	Dropwort, Canby's (*Oxypolis canbyi*)
E	Harperella (*Ptilimnium nodosum*)
E	Sumac, Michaux's (*Rhus michauxii*)
E	Arrowhead, bunched (*Sagittaria fasciculata*)
E	Pitcher-plant, green (*Sarracenia oreophila*)
E	Pitcher-plant, mountain sweet (*Sarracenia rubra* ssp. *jonesii*)
E	Chaffseed, American (*Schwalbea americana*)
E	Irisette, white (*Sisyrinchium dichotomum*)
T	Goldenrod, Blue Ridge (*Solidago spithamaea*)
T	Spiraea, Virginia (*Spiraea virginiana*)
E	Meadowrue, Cooley's (*Thalictrum cooleyi*)

Ohio -- 26 listings

Animals – 20

Status	**Listing**
E	Bat, Indiana (*Myotis sodalis*)
E	Beetle, American burying (*Nicrophorus americanus*)
E	Butterfly, Karner blue (*Lycaeides melissa samuelis*)

E Butterfly, Mitchell's satyr (*Neonympha mitchellii mitchellii*)
E Catspaw (=purple cat's paw pearlymussel) Entire Range; Except where listed as Experimental Populations (*Epioblasma obliquata obliquata*)
XN Catspaw (=purple cat's paw pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma obliquata obliquata*)
E Catspaw, white (pearlymussel) (*Epioblasma obliquata perobliqua*)
E Clubshell Entire Range; Except where listed as Experimental Populations (*Pleurobema clava*)
E Dragonfly, Hine's emerald (*Somatochlora hineana*)
T Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
E Fanshell (*Cyprogenia stegaria*)
E Madtom, Scioto (*Noturus trautmani*)
E Mucket, pink (pearlymussel) (*Lampsilis abrupta*)
E Plover, piping (Great Lakes watershed) (*Charadrius melodus*)
T Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)
E Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
E Riffleshell, northern (*Epioblasma torulosa rangiana*)
T Snake, copperbelly water (MI, OH, IN N of 400 N. Lat.) (*Nerodia erythrogaster neglecta*)
T Snake, Lake Erie water (subspecies range clarified) (*Nerodia sipedon insularum*)
T Wolf, gray Eastern Distinct Population Segment (*Canis lupus*)

Plants -- 6

Status Listing
T Monkshood, northern wild (*Aconitum noveboracense*)
T Daisy, lakeside (*Hymenoxys herbacea*)
T Pogonia, small whorled (*Isotria medeoloides*)
T Orchid, eastern prairie fringed (*Platanthera leucophaea*)
T Spiraea, Virginia (*Spiraea virginiana*)
E Clover, running buffalo (*Trifolium stoloniferum*)

Pennsylvania -- 17 listings

Animals – 14

Status Listing
E Bat, Indiana (*Myotis sodalis*)
E Clubshell Entire Range; Except where listed as Experimental Populations (*Pleurobema clava*)
T Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
E Mucket, pink (pearlymussel) (*Lampsilis abrupta*)
E Pearlymussel, cracking Entire Range; Except where listed as Experimental Populations (*Hemistena lata*)
E Pigtoe, rough (*Pleurobema plenum*)
E Pimpleback, orangefoot (pearlymussel) (*Plethobasus cooperianus*)
E Plover, piping (Great Lakes watershed) (*Charadrius melodus*)
E Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
E Riffleshell, northern (*Epioblasma torulosa rangiana*)
E Ring pink (mussel) (*Obovaria retusa*)
T Turtle, bog (=Muhlenberg) (northern) (*Clemmys muhlenbergii*)
E Wedgemussel, dwarf (*Alasmidonta heterodon*)
T Wolf, gray Eastern Distinct Population Segment (*Canis lupus*)

Plants -- 3

Status Listing
T Pogonia, small whorled (*Isotria medeoloides*)
E Bulrush, Northeastern (*Scirpus ancistrochaetus*)
T Spiraea, Virginia (*Spiraea virginiana*)\

Rhode Island -- 17 listings

Animals – 15

Status Listing
E Beetle, American burying (*Nicrophorus americanus*)
T Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
T Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)
E Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
E Sea turtle, hawksbill (*Eretmochelys imbricata*)
E Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E Sea turtle, leatherback (*Dermochelys coriacea*)
T Sea turtle, loggerhead (*Caretta caretta*)
E Sturgeon, shortnose (*Acipenser brevirostrum*)
E Tern, roseate (northeast U.S. nesting pop.) (*Sterna dougallii dougallii*)
Tiger beetle, northeastern beach (*Cicindela dorsalis dorsalis*)
E Whale, finback (*Balaenoptera physalus*)
E Whale, humpback (*Megaptera novaeangliae*)
E Whale, right (*Balaena glacialis (incl. australis)*)
T Wolf, gray Eastern Distinct Population Segment (*Canis lupus*)

Plants -- 2

Status	Listing
E	Gerardia, sandplain (*Agalinis acuta*)
T	Pogonia, small whorled (*Isotria medeoloides*)

South Carolina -- 42 listings

Animals -- 22

Status	Listing
T(S/A)	Alligator, American (*Alligator mississippiensis*)
E	Bat, Indiana (*Myotis sodalis*)
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
E	Heelsplitter, Carolina (*Lasmigona decorata*)
T	Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
T	Salamander, flatwoods (*Ambystoma cingulatum*)
T	Sea turtle, green (except where endangered) (*Chelonia mydas*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
T	Snake, eastern indigo (*Drymarchon corais couperi*)
E	Stork, wood (AL, FL, GA, SC) (*Mycteria americana*)
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
T	Tern, roseate (Western Hemisphere except NE U.S.) (*Sterna dougallii dougallii*)
T(S/A)	Turtle, bog (=Muhlenberg) (southern) (*Clemmys muhlenbergii*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, humpback (*Megaptera novaeangliae*)
E	Whale, right (*Balaena glacialis (incl. australis)*)
E	Wolf, red (except where XN) (*Canis rufus*)
E	Woodpecker, red-cockaded (*Picoides borealis*)

Plants -- 20

Status	Listing
T	Amaranth, seabeach (*Amaranthus pumilus*)
T	Amphianthus, little (*Amphianthus pusillus*)
E	Coneflower, smooth (*Echinacea laevigata*)
E	Sunflower, Schweinitz's (*Helianthus schweinitzii*)
T	Pink, swamp (*Helonias bullata*)
T	Heartleaf, dwarf-flowered (*Hexastylis naniflora*)
E	Quillwort, black spored (*Isoetes melanospora*)
T	Pogonia, small whorled (*Isotria medeoloides*)
E	Pondberry (*Lindera melissifolia*)
E	Loosestrife, rough-leaved (*Lysimachia asperulaefolia*)
E	Dropwort, Canby's (*Oxypolis canbyi*)
E	Harperella (*Ptilimnium nodosum*)
E	Sumac, Michaux's (*Rhus michauxii*)
T	Gooseberry, Miccosukee (*Ribes echinellum*)
E	Arrowhead, bunched (*Sagittaria fasciculata*)
E	Pitcher-plant, mountain sweet (*Sarracenia rubra ssp. jonesii*)
E	Chaffseed, American (*Schwalbea americana*)
E	Irisette, white (*Sisyrinchium dichotomum*)
E	Trillium, persistent (*Trillium persistens*)
E	Trillium, relict (*Trillium reliquum*)

Tennessee -- 96 listings

Animals – 76

Status	Listing
E	Acornshell, southern (*Epioblasma othcaloogensis*)
E	Bat, gray (*Myotis grisescens*)
E	Bat, Indiana (*Myotis sodalis*)
E	Bean, Cumberland (pearlymussel) Entire Range; Except where listed as Experimental Populations (*Villosa trabalis*)
XN	Bean, Cumberland (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Villosa trabalis*)
E	Bean, purple (*Villosa perpurpurea*)
E	Blossom, green (pearlymussel) (*Epioblasma torulosa gubernaculum*)
E	Blossom, tubercled (pearlymussel) Entire Range; Except where listed as Experimental Populations (*Epioblasma torulosa torulosa*)
XN	Blossom, tubercled (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma torulosa torulosa*)
E	Blossom, turgid (pearlymussel) Entire Range; Except where listed as Experimental Populations (*Epioblasma turgidula*)
XN	Blossom, turgid (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma turgidula*)

APPENDIX C

E	Blossom, yellow (pearlymussel) Entire Range; Except where listed as Experimental Populations (*Epioblasma florentina florentina*)
XN	Blossom, yellow (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma florentina florentina*)
E	Catspaw (=purple cat's paw pearlymussel) Entire Range; Except where listed as Experimental Populations (*Epioblasma obliquata obliquata*)
XN	Catspaw (=purple cat's paw pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma obliquata obliquata*)
T	Chub, slender (*Erimystax cahni*)
T	Chub, spotfin Entire (*Cyprinella monacha*)
E	Combshell, Cumberlandian Entire Range; Except where listed as Experimental Populations (*Epioblasma brevidens*)
XN	Combshell, Cumberlandian AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma brevidens*)
E	Combshell, upland (*Epioblasma metastriata*)
E	Crayfish, Nashville (*Orconectes shoupi*)
T	Dace, blackside (*Phoxinus cumberlandensis*)
E	Darter, amber (*Percina antesella*)
E	Darter, bluemask (=jewel) (*Etheostoma l*)
E	Darter, boulder (*Etheostoma wapiti*)
E	Darter, duskytail Entire (*Etheostoma percnurum*)
T	Darter, slackwater (*Etheostoma boschungi*)
T	Darter, snail (*Percina tanasi*)
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
E	Elktoe, Appalachian (*Alasmidonta raveneliana*)
E	Elktoe, Cumberland (*Alasmidonta atropurpurea*)
E	Fanshell (*Cyprogenia stegaria*)
E	Kidneyshell, triangular (*Ptychobranchus greeni*)
E	Lampmussel, Alabama Entire Range; Except where listed as Experimental Populations (*Lampsilis virescens*)
E	Lilliput, pale (pearlymussel) (*Toxolasma cylindrelius*)
E	Logperch, Conasauga (*Percina jenkinsi*)
E	Madtom, pygmy (*Noturus stanauli*)
E	Madtom, smoky Entire (*Noturus baileyi*)
XN	Madtom, yellowfin Holston River, VA, TN (*Noturus flavipinnis*)
T	Madtom, yellowfin (except where XN) (*Noturus flavipinnis*)
E	Mapleleaf, winged (mussel) Entire; except where listed as experimental populations (*Quadrula fragosa*)
E	Marstonia, royal (snail) (*Pyrgulopsis ogmorhaphe*)
E	Moccasinshell, Coosa (*Medionidus parvulus*)
E	Monkeyface, Appalachian (pearlymussel) (*Quadrula sparsa*)
E	Monkeyface, Cumberland (pearlymussel) Entire Range; Except where listed as Experimental Populations (*Quadrula intermedia*)
XN	Monkeyface, Cumberland (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Quadrula intermedia*)
E	Mucket, pink (pearlymussel) (*Lampsilis abrupta*)
E	Mussel, oyster Entire Range; Except where listed as Experimental Populations (*Epioblasma capsaeformis*)
XN	Mussel, oyster AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma capsaeformis*)
E	Pearlymussel, birdwing Entire Range; Except where listed as Experimental Populations (*Conradilla caelata*)
E	Pearlymussel, cracking Entire Range; Except where listed as Experimental Populations (*Hemistena lata*)
E	Pearlymussel, dromedary Entire Range; Except where listed as Experimental Populations (*Dromus dromas*)
E	Pearlymussel, littlewing (*Pegias fabula*)
E	Pigtoe, Cumberland (*Pleurobema gibberum*)
E	Pigtoe, finerayed Entire Range; Except where listed as Experimental Populations (*Fusconaia cuneolus*)
XN	Pigtoe, finerayed AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Fusconaia cuneolus*)
E	Pigtoe, rough (*Pleurobema plenum*)
E	Pigtoe, shiny Entire Range; Except where listed as Experimental Populations (*Fusconaia cor*)
XN	Pigtoe, shiny AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Fusconaia cor*)
E	Pigtoe, southern (*Pleurobema georgianum*)
E	Pimpleback, orangefoot (pearlymussel) (*Plethobasus cooperianus*)
T	Pocketbook, finelined (*Lampsilis altilis*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
E	Rabbitsfoot, rough (*Quadrula cylindrica strigillata*)
E	Riffleshell, tan (*Epioblasma florentina walkeri (=E. walkeri)*)
E	Ring pink (mussel) (*Obovaria retusa*)
E	Riversnail, Anthony's Entire Range; Except where listed as Experimental Populations (*Athearnia anthonyi*)
XN	Riversnail, Anthony's AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Athearnia anthonyi*)
T	Shiner, blue (*Cyprinella caerulea*)
T	Snail, painted snake coiled forest (*Anguispira picta*)

E	Spider, spruce-fir moss (*Microhexura montivaga*)
E	Squirrel, Carolina northern flying (*Glaucomys sabrinus coloratus*)
E	Sturgeon, pallid (*Scaphirhynchus albus*)
E	Tern, least (interior pop.) (*Sterna antillarum*)
E	Wartyback, white (pearlymussel) (*Plethobasus cicatricosus*)
XN	Wolf, red [XN] (*Canis rufus*)

Plants -- 20

Status	Listing
T	Potato-bean, Price's (*Apios priceana*)
E	Rock-cress, Braun's (*Arabis perstellata*)
E	Sandwort, Cumberland (*Arenaria cumberlandensis*)
T	Fern, American hart's-tongue (*Asplenium scolopendrium* var. *americanum*)
E	Ground-plum, Guthrie's (=Pyne's) (*Astragalus bibullatus*)
T	Rosemary, Cumberland (*Conradina verticillata*)
E	Prairie-clover, leafy (*Dalea foliosa*)
E	Coneflower, Tennessee purple (*Echinacea tennesseensis*)
E	Avens, spreading (*Geum radiatum*)
E	Lichen, rock gnome (*Gymnoderma lineare*)
E	Bluet, Roan Mountain (*Hedyotis purpurea* var. *montana*)
T	Sunflower, Eggert's (*Helianthus eggertii*)
T	Pogonia, small whorled (*Isotria medeoloides*)
E	Bladderpod, Spring Creek (*Lesquerella perforata*)
E	Aster, Ruth's golden (*Pityopsis ruthii*)
E	Pitcher-plant, green (*Sarracenia oreophila*)
T	Skullcap, large-flowered (*Scutellaria montana*)
T	Goldenrod, Blue Ridge (*Solidago spithamaea*)
T	Spiraea, Virginia (*Spiraea virginiana*)
E	Grass, Tennessee yellow-eyed (*Xyris tennesseensis*)

Texas -- 91 listings

Animals -- 63

Status	Listing
T(S/A)	Alligator, American (*Alligator mississippiensis*)
E	Amphipod, Peck's cave (*Stygobromus (=Stygonectes) pecki*)
E	Bat, Mexican long-nosed (*Leptonycteris nivalis*)
T(S/A)	Bear, American black (County range of LA b.bear) (*Ursus americanus*)
T	Bear, Louisiana black (*Ursus americanus luteolus*)
E	Beetle, Coffin Cave mold (*Batrisodes texanus*)
E	Beetle, Comal Springs dryopid (*Stygoparnus comalensis*)
E	Beetle, Comal Springs riffle (*Heterelmis comalensis*)
E	Beetle, Helotes mold (*Batrisodes venyivi*)
E	Beetle, Kretschmarr Cave mold (*Texamaurops reddelli*)
E	Beetle, Tooth Cave ground (*Rhadine persephone*)
E	Crane, whooping (except where XN) (*Grus americana*)
E	Curlew, Eskimo (*Numenius borealis*)
E	Darter, fountain (*Etheostoma fonticola*)
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
E	Falcon, northern aplomado (*Falco femoralis septentrionalis*)
E	Flycatcher, southwestern willow (*Empidonax traillii extimus*)
E	Gambusia, Big Bend (*Gambusia gaigei*)
E	Gambusia, Clear Creek (*Gambusia heterochir*)
E	Gambusia, Pecos (*Gambusia nobilis*)
E	Gambusia, San Marcos (*Gambusia georgei*)
E	Ground beetle, [unnamed] (*Rhadine exilis*)
E	Ground beetle, [unnamed] (*Rhadine infernalis*)
E	Harvestman, Bee Creek Cave (*Texella reddelli*)
E	Harvestman, Bone Cave (*Texella reyesi*)
E	Harvestman, Cokendolpher Cave (*Texella cokendolpheri*)
E	Jaguar (*Panthera onca*)
E	Jaguarundi, Gulf Coast (*Herpailurus (=Felis) yagouaroundi cacomitli*)
E	Meshweaver, Braken Bat Cave (*Cicurina venii*)
E	Meshweaver, Government Canyon Bat Cave (*Cicurina vespera*)
E	Meshweaver, Madla's Cave (*Cicurina madla*)
E	Meshweaver, Robber Baron Cave (*Cicurina baronia*)
T	Minnow, Devils River (*Dionda diaboli*)
E	Minnow, Rio Grande silvery (*Hybognathus amarus*)
E	Ocelot (*Leopardus (=Felis) pardalis*)
T	Owl, Mexican spotted (*Strix occidentalis lucida*)
E	Pelican, brown (except U.S. Atlantic coast, FL, AL) (*Pelecanus occidentalis*)
T	Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)

E Prairie-chicken, Attwater's greater (*Tympanuchus cupido attwateri*)
E Pseudoscorpion, Tooth Cave (*Tartarocreagris texana*)
E Pupfish, Comanche Springs (*Cyprinodon elegans*)
E Pupfish, Leon Springs (*Cyprinodon bovinus*)
E Salamander, Barton Springs (*Eurycea sosorum*)
T Salamander, San Marcos (*Eurycea nana*)
E Salamander, Texas blind (*Typhlomolge rathbuni*)
T Sea turtle, green (except where endangered) (*Chelonia mydas*)
E Sea turtle, hawksbill (*Eretmochelys imbricata*)
E Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E Sea turtle, leatherback (*Dermochelys coriacea*)
T Sea turtle, loggerhead (*Caretta caretta*)
T Shiner, Arkansas River (Arkansas R. Basin) (*Notropis girardi*)
T Snake, Concho water (*Nerodia paucimaculata*)
E Spider, Government Canyon Bat Cave (*Neoleptoneta microps*)
E Spider, Tooth Cave (*Neoleptoneta myopica*)
E Tern, least (interior pop.) (*Sterna antillarum*)
E Toad, Houston (*Bufo houstonensis*)
E Vireo, black-capped (*Vireo atricapilla*)
E Warbler (=wood), golden-cheeked (*Dendroica chrysoparia*)
E Whale, finback (*Balaenoptera physalus*)
E Whale, humpback (*Megaptera novaeangliae*)
E Wolf, gray Southwestern Distinct Population Segment (*Canis lupus*)
XN Wolf, gray Mexican gray wolf, EXPN population (*Canis lupus*)
E Woodpecker, red-cockaded (*Picoides borealis*)

Plants -- 28

Status	Listing
E	Sand-verbena, large-fruited (*Abronia macrocarpa*)
E	Ambrosia, south Texas (*Ambrosia cheiranthifolia*)
E	Cactus, Tobusch fishhook (*Ancistrocactus tobuschii*)
E	Cactus, star (*Astrophytum asterias*)
E	Ayenia, Texas (*Ayenia limitaris*)
E	Poppy-mallow, Texas (*Callirhoe scabriuscula*)
E	Cactus, Nellie cory (*Coryphantha minima*)
T	Cory cactus, bunched (*Coryphantha ramillosa*)
E	Cactus, Sneed pincushion (*Coryphantha sneedii* var. *sneedii*)
E	Cat's-eye, Terlingua Creek (*Cryptantha crassipes*)
T	Cactus, Chisos Mountain hedgehog (*Echinocereus chisoensis* var. *chisoensis*)
E	Cactus, black lace (*Echinocereus reichenbachii* var. *albertii*)
E	Pitaya, Davis' green (*Echinocereus viridiflorus* var. *davisii*)
T	Cactus, Lloyd's Mariposa (*Echinomastus mariposensis*)
E	Frankenia, Johnston's (*Frankenia johnstonii*)
T	Sunflower, Pecos (=puzzle, =paradox) (*Helianthus paradoxus*)
E	Rush-pea, slender (*Hoffmannseggia tenella*)
E	Dawn-flower, Texas prairie (*Hymenoxys texana*)
E	Bladderpod, white (*Lesquerella pallida*)
E	Bladderpod, Zapata (*Lesquerella thamnophila*)
E	Manioc, Walker's (*Manihot walkerae*)
E	Phlox, Texas trailing (*Phlox nivalis* ssp. *texensis*)
	Pondweed, Little Aguja (=Creek) (*Potamogeton clystocarpus*)
T	Oak, Hinckley (*Quercus hinckleyi*)
E	Ladies'-tresses, Navasota (*Spiranthes parksii*)
E	Snowbells, Texas (*Styrax texanus*)
E	Dogweed, ashy (*Thymophylla tephroleuca*)
E	Wild-rice, Texas (*Zizania texana*)

Vermont -- 8 listings

Animals – 6

Status	Listing
E	Bat, Indiana (*Myotis sodalis*)
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
T	Tiger beetle, Puritan (*Cicindela puritana*)
E	Wedgemussel, dwarf (*Alasmidonta heterodon*)
T	Wolf, gray Eastern Distinct Population Segment (*Canis lupus*)

Plants -- 2

Status	Listing
E	Milk-vetch, Jesup's (*Astragalus robbinsii* var. *jesupi*)
E	Bulrush, Northeastern (*Scirpus ancistrochaetus*)

APPENDIX C

Virginia -- 71 listings

Animals -- 56

Status	Listing
E	Bat, gray (*Myotis grisescens*)
E	Bat, Indiana (*Myotis sodalis*)
E	Bat, Virginia big-eared (*Corynorhinus (=Plecotus) townsendii virginianus*)
XN	Bean, Cumberland (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Villosa trabalis*)
E	Bean, purple (*Villosa perpurpurea*)
E	Blossom, green (pearlymussel) (*Epioblasma torulosa gubernaculum*)
T	Chub, slender (*Erimystax cahni*)
T	Chub, spotfin Entire (*Cyprinella monacha*)
E	Combshell, Cumberlandian Entire Range Except where listed as Experimental Populations (*Epioblasma brevidens*)
XN	Combshell, Cumberlandian AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma brevidens*)
E	Darter, duskytail Entire (*Etheostoma percnurum*)
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
E	Fanshell (*Cyprogenia stegaria*)
E	Isopod, Lee County cave (*Lirceus usdagalun*)
T	Isopod, Madison Cave (*Antrolana lira*)
E	Logperch, Roanoke (*Percina rex*)
XN	Madtom, yellowfin Holston River, VA, TN (*Noturus flavipinnis*)
T	Madtom, yellowfin (except where XN) (*Noturus flavipinnis*)
E	Monkeyface, Appalachian (pearlymussel) (*Quadrula sparsa*)
E	Monkeyface, Cumberland (pearlymussel) Entire Range; Except where listed as Experimental Populations (*Quadrula intermedia*)
XN	Monkeyface, Cumberland (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Quadrula intermedia*)
E	Mucket, pink (pearlymussel) (*Lampsilis abrupta*)
E	Mussel, oyster Entire Range; Except where listed as Experimental Populations (*Epioblasma capsaeformis*)
XN	Mussel, oyster AL, Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma capsaeformis*)
E	Pearlymussel, birdwing Entire Range; Except where listed as Experimental Populations (*Conradilla caelata*)
E	Pearlymussel, cracking Entire Range; Except where listed as Experimental Populations (*Hemistena lata*)
E	Pearlymussel, dromedary Entire Range; Except where listed as Experimental Populations (*Dromus dromas*)
E	Pearlymussel, littlewing (*Pegias fabula*)
E	Pigtoe, finerayed Entire Range; Except where listed as Experimental Populations (*Fusconaia cuneolus*)
XN	Pigtoe, finerayed AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Fusconaia cuneolus*)
E	Pigtoe, rough (*Pleurobema plenum*)
E	Pigtoe, shiny Entire Range; Except where listed as Experimental Populations (*Fusconaia cor*)
XN	Pigtoe, shiny AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Fusconaia cor*)
T	Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
E	Rabbitsfoot, rough (*Quadrula cylindrica strigillata*)
E	Riffleshell, tan (*Epioblasma florentina walkeri (=E. walkeri)*)
E	Salamander, Shenandoah (*Plethodon shenandoah*)
T	Sea turtle, green (except where endangered) (*Chelonia mydas*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
E	Snail, Virginia fringed mountain (*Polygyriscus virginianus*)
E	Spinymussel, James (*Pleurobema collina*)
E	Squirrel, Delmarva Peninsula fox (except Sussex Co., DE) (*Sciurus niger cinereus*)
E	Squirrel, Virginia northern flying (*Glaucomys sabrinus fuscus*)
E	Sturgeon, shortnose (*Acipenser brevirostrum*)
E	Tern, roseate (northeast U.S. nesting pop.) (*Sterna dougallii dougallii*)
T	Tiger beetle, northeastern beach (*Cicindela dorsalis dorsalis*)
T(S/A)	Turtle, bog (=Muhlenberg) (southern) (*Clemmys muhlenbergii*)
E	Wedgemussel, dwarf (*Alasmidonta heterodon*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, humpback (*Megaptera novaeangliae*)
E	Whale, right (*Balaena glacialis (incl. australis)*)
E	Woodpecker, red-cockaded (*Picoides borealis*)

Plants -- 15

Status	Listing
T	Joint-vetch, sensitive (*Aeschynomene virginica*)
T	Amaranth, seabeach (*Amaranthus pumilus*)

E Rock-cress, shale barren (*Arabis serotina*)
T Birch, Virginia round-leaf (*Betula uber*)
E Bittercress, small-anthered (*Cardamine micranthera*)
E Coneflower, smooth (*Echinacea laevigata*)
T Sneezeweed, Virginia (*Helenium virginicum*)
T Pink, swamp (*Helonias bullata*)
E Mallow, Peter's Mountain (*Iliamna corei*)
T Pogonia, small whorled (*Isotria medeoloides*)
T Orchid, eastern prairie fringed (*Platanthera leucophaea*)
E Harperella (*Ptilimnium nodosum*)
E Sumac, Michaux's (*Rhus michauxii*)
E Bulrush, Northeastern (*Scirpus ancistrochaetus*)
T Spiraea, Virginia (*Spiraea virginiana*)

West Virginia -- 21 listings

Animals -- 15

Status	Listing
E	Bat, gray (*Myotis grisescens*)
E	Bat, Indiana (*Myotis sodalis*)
E	Bat, Virginia big-eared (*Corynorhinus (=Plecotus) townsendii virginianus*)
E	Blossom, tubercled (pearlymussel) Entire Range; Except where listed as Experimental Populations (*Epioblasma torulosa torulosa*)
XN	Blossom, tubercled (pearlymussel) AL; Free-Flowing Reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale Counties, AL (*Epioblasma torulosa torulosa*)
E	Clubshell Entire Range; Except where listed as Experimental Populations (*Pleurobema clava*)
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
E	Fanshell (*Cyprogenia stegaria*)
E	Mucket, pink (pearlymussel) (*Lampsilis abrupta*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
E	Riffleshell, northern (*Epioblasma torulosa rangiana*)
T	Salamander, Cheat Mountain (*Plethodon nettingi*)
T	Snail, flat-spired three-toothed (*Triodopsis platysayoides*)
E	Spinymussel, James (*Pleurobema collina*)
E	Squirrel, Virginia northern flying (*Glaucomys sabrinus fuscus*)

Plants -- 6

Status	Listing
E	Rock-cress, shale barren (*Arabis serotina*)
T	Pogonia, small whorled (*Isotria medeoloides*)
E	Harperella (*Ptilimnium nodosum*)
E	Bulrush, Northeastern (*Scirpus ancistrochaetus*)
T	Spiraea, Virginia (*Spiraea virginiana*)
E	Clover, running buffalo (*Trifolium stoloniferum*)

APPENDIX D

SUMMARY OF SPECIES LISTED AS THREATENED, ENDANGERED, OR SPECIAL STATUS UNDER STATE LAWS IN STATES PROPOSED FOR APHIS-WS CONTINUED OR EXPANDED INVOLVEMENT IN ORAL RABIES VACCINATION PROGRAMS

Number of State Listed Species by Category
(Species for which concerns about ORV programs might be raised are identified and shown in bold)
Information obtained from http://training.fws.gov/IAFWA/mat/website/statelinks.html in August, 2004

State	Mammals	Birds	Reptiles	Amphibians	Fish	Invertebrates	Plants
Alabama	9NG **long-tailed weasel**	19NG	13NG	8NG	23NG	32E, 10T	11E, 7T
Connecticut	2E, 9SC **gray wolf, eastern puma**	21E, 9T, 20SC	4E, 3T, 4SC	1E, 3T, 3SC	3E, 2T, 2SC	17E, 24T, 128SC	119E, 38T, 186SC
Delaware	1E **Delmarva fox squirrel**	24E	6E	2E	1E	15E	
Florida	20E, 4T, 6SSC **Florida black bear, Everglades mink, Florida panther, Sherman's fox squirrel, Lower Keys marsh rabbit, Big Cypress fox squirrel**	8E, 10T, 18SSC	6E, 10T, 8SSC	5 SSC	3E, 2T, 10 SSC	4E, 4SSC	335E, 67T
Georgia	7E, 1T, 1R **eastern puma, Florida panther, round-tailed muskrat**	6E, 2T, 7R	3E, 7T, 2R, 1U	2T, 5R	16E, 18T, 19R, 2U	13E, 4T	38E, 49T, 12R, 7U
Indiana	10E, 12SC **American badger, bobcat, northern river otter, least weasel**	28E, 11SC	15E, 2SC	5E, 5SC	12E, 8SC	15E, 11SC	208E, 90T, 107R
Kentucky	5E, 3T, 3SC **American black bear, eastern spotted skunk, least weasel**	19E, 10T, 16SC	3E, 8T, 7SC	1E, 5T, 9SC	27E, 13T, 16SC	28E, 9T, 12SC	155E, 5T
Louisiana	7E, 1 T **Louisiana black bear, Florida panther, red wolf**	9E, 2T	3E, 4T, 2C	1E	1E, 1T, 2C	4E, 1T	2E, 1T
Maine	1T	9E, 6T	3E, 2T	0	1T	6E,6T	88E, 98T, 105SC
Maryland	11E, 7I	14E,	7E, 3T,	5E, 1T, 2I	6E,	27E, 5T, 8I	265E,

	North American porcupine, bobcat, least weasel, Delmarva fox squirrel, New England cottontail	4T, 8I	1I		7T, 3I		79T
Massachusetts	7E, 4SC	12E, 6T, 10SC	8E, 5T, 3SC	2T, 4SC	4E, 2T, 4SC	29E, 25T, 58SC	61E, 32T, 11SC
Michigan	4E, 2T, 4SC **eastern puma, Canada lynx, gray wolf**	8E, 13T, 21SC	2E, 2T, 6SC	1E, 1T, 2SC	8E, 7T, 11SC	19E, 15T, 110SC	31E, 210T, 110SC
Mississippi	6E **American black bear, Louisiana black bear, Florida panther**	12E	14E	5E	15E	25E	4E
New Hampshire	2E, 1T **Canada lynx, American marten**	12E, 7T	1E, 1T	1E	2E	6E, 3T	130E, 146T, 11C
New Jersey	9E **bobcat**	17E, 16T	8E, 3T	3E, 3T	1E	9E, 3T	0
New York	10E, 1T, 3SC **Canada lynx, New England cottontail, gray wolf, eastern puma**	10E, 10T, 19SC	7E, 5T, 6SC	2E, 7SC	8E, 11T, 5SC	16E, 8T, 18SC	4E, 7T
North Carolina	6E, 2T, 11SC **eastern puma, Carolina northern flying squirrel**	8E, 4T, 16SC	5E, 4T, 11SC	1E, 4T, 12SC	9E, 13T, 27SC	23E, 20T, 38SC	96E, 45T, 20SC
Ohio	5E, 8SC **bobcat, snowshoe hare, American black bear, ermine, American badger**	19E, 8T, 13SC, 30SI	5E, 2T, 8 SC	5E, 1T, 1 SC	24E, 13T, 9SC	70E, 23T, 51SC, 11SI	253E, 162T
Pennsylvania	3E, 3T **Delmarva fox squirrel**	11E, 5T	3E, 2T	3E, 1T	8E, 10T	2SC	13E, 5T
Rhode Island	1T, 5C **bobcat**	7E, 8T, 36C	3E, 2T, 5C	1T, 2C	1C	1E, 3T, 48C	51E, 57T, 139C
South Carolina	3E, 1T, 24SC **American black bear, eastern fox squirrel, New England**	6E, 2T, 11SC	1E, 4T, 12SC	3E, 2T, 11SC	1E, 1T, 9SC	1E, 8SC	14E, 6T, 462SC

	cottontail, eastern spotted skunk, swamp rabbit						
Tennessee	3E, 14SM **Carolina northern flying squirrel**	4E, 4T, 21SM	3T, 4SM	1T, 10SM	20E, 17T, 40SM	51E, 4T, 1SM	196E, 133T, 186S
Texas	12E, 20T **ocelot, jaguarondi, jaguar, gray wolf, red wolf, Louisiana black bear, black bear, white-nosed coati, black-footed ferret, margay**	13E, 21T	3E, 21T	3E, 10T	8E, 22T	1E	23E, 5T
Vermont	4E, 1T, 4SC **Canada lynx, eastern cougar, American marten, New England cottontail**	9E, 3T, 19SC	3E, 1T, 6SC	1E, 5SC	4E, 2T, 12SC	8E, 6T, 12SC	61E, 90T
Virginia	18E, 1T, 3SC **Delmarva fox squirrel, eastern puma, gray wolf, snowshoe hare, Virginia northern flying squirrel, marsh rabbit, northern river otter**	6E, 8T, 31SC	6E, 4T, 1SC	1T, 9SC	7E, 13T, 17SC	36E, 12T, 18SC	56E, 28T, 11SC
West Virginia	6S1, 11S2, 5S3 **West Virginia northern flying squirrel, eastern spotted skunk, Appalachian cottontail**	28S1, 15S2, 15S3	3S1, 9S2, 6S3	6S1, 7S2, 5S3	26S1, 26S2, 20S3	173S1, 80S2, 26S3	267S1, 136S2, 27S3

C=Candidate Species for Listing as Threatened or Endangered; NG=Nongame Species Regulation; ISP=Invertebrate Species Regulation; SSC or SC=Species of Concern or Special Concern; SI="Special Interest" Species; PEx=Possibly Extirpated; E=State Endangered; T=State Threatened; SM=Species in Need of Management; I=In need of Conservation; R=Rare; U=Unusual; S1, S2, or S3=WV designations for levels of concern.

State	T&E Protections under State Law
Alabama	no state threatened or endangered status; certain listed "nongame" species given special protection against "take"; "take" not specifically defined
Connecticut	it is unlawful for (1) any person to willfully take any endangered or threatened species on or from public property, waters of the state, or property of another without the written permission of the owner on whose property the species occurs; (2) any person, including the

	owner of the land on which an endangered or threatened species occurs, to willfully take an endangered or threatened species for the purpose of selling, offering for sale, transporting for commercial gain or exporting such specimen; (3) any state agency to destroy or adversely modify essential habitat designated pursuant to section 26-306, so as to reduce the viability of the habitat to support endangered or threatened species or so as to kill, injure, or appreciably reduce the likelihood of survival of the species.
Delaware	the Division may designate species of fish and wildlife that are seriously threatened with extinction as endangered species
Florida	unlawful to "capture" endangered or to "take" threatened species without permit.
Georgia	species are listed as endangered, threatened, rare or unusual and are given this status under the Georgia Endangered wildlife Act of 1973.
Indiana	vertebrates, mollusks, and crustaceans classified as endangered in Indiana are protected from taking pursuant to the Nongame and Endangered Species Act of 1973 and Fish and Wildlife Administrative Rules
Kentucky	state laws define "take" for state-listed endangered species similar to ESA; state threatened, species of concern, and historical biota have no special additional protection
Louisiana	the state should assist in the protection of species of wildlife which are determined to be "threatened" or "endangered" elsewhere pursuant to the Federal Endangered Species Act, as concurred by the Louisiana Wildlife and Fisheries Commission, by prohibiting the taking, possession, transportation, exportation from the state, processing, sale or offer for sale or shipment within this state of such endangered species, or by carefully regulating such activities with regard to such species
Maine	unlawful to "hunt, take or trap" any endangered or threatened species without a permit issued for specific action by the commissioner or the state of Maine
Maryland	state law defines "take" similar to ESA; endangered and threatened categories have protections against "take"
Massachusetts	"take" defined similar to ESA; threatened, endangered, and "special concern" categories have equal protections against "take"
Michigan	a person shall not take, possess, transport, import, export, process, sell, offer for sale, buy, or offer to buy, and a common or contract carrier shall not transport or receive for shipment, any species of fish, plants, or wildlife on the following lists: (a) The list of fish, plants, and wildlife indigenous to the state determined to be endangered or threatened within the state pursuant to section 36503 or subsection (3). (b) The United States list of endangered or threatened native fish and wildlife. (c) The United States list of endangered or threatened plants. (d) The United States list of endangered or threatened foreign fish and wildlife
Mississippi	All birds of prey (eagles, hawks, osprey, owls, kites and vultures) and other nongame birds are protected and may not be hunted, molested, bought or sold. English sparrows, starlings, blackbirds and crows may be taken according to regulations. The following endangered species are also protected: black bear, Florida panther, gray bat, Indiana bat, all sea turtles, gopher tortoise, sawback turtles (black-knobbed, ringed, yellow-blotched), black pine snake, eastern indigo snake, rainbow snake, and the southern hognose snake
New Hampshire	With respect to any endangered or threatened species, it is unlawful to: (a) Export any such species from this state; (b) Take any such species within this state; (c) Possess, process, sell or offer for sale, deliver, carry, transport or ship, by any means whatsoever, any such species; (d) Violate any rule adopted under this chapter pertaining to the conservation of such species of wildlife listed pursuant to RSA 212-A:6, IV

New Jersey	unlawful to "take" any endangered species of fish or wildlife; "take" defined similar to ESA; no exemptions or permits to allow for incidental take
New York	endangered and threatened categories have protections against "take"; "special concern" category has no special additional protection
North Carolina	unlawful to take or possess any endangered, threatened, or special concern species at any time without the appropriate permit
Ohio	unlawful to "take" any endangered species of fish or wildlife; "take" not specifically defined; no exemptions or permits to allow for incidental take; no special protections for "threatened" or "special interest" species; APHIS-WS advised to just release any state listed species if captured or to report accidental mortality
Pennsylvania	endangered and threatened categories have protections against "take"
Rhode Island	no person shall buy, sell, offer for sale, store, transport, import, export, or otherwise traffic in any animal or plant or any part of any animal or plant whether living, dead, processed, manufactured, preserved, or raw if the animal or plant has been declared to be an endangered species by either the United States secretaries of the interior or commerce or the director of the Rhode Island department of environmental management; exception is for purposes of scientific research or educational display either of which must be done by or under the formal supervision of a legitimate college or university and then only upon the issuance of a special permit for each individual excepted species
South Carolina	unlawful to take, possess, transport, export, process, sell or ship wildlife in need of management except as otherwise provided
Tennessee	unlawful to take, possess, transport, export or ship any endangered or threatened species without permit; regulations allow provisions for "take" to alleviate damage and to protect human health and safety
Texas	unlawful to "take" any endangered or threatened species without the issuance of a permit; "take" not specifically defined; state law includes all federally listed species as state listed
Vermont	unlawful to "take" any endangered or threatened species without the issuance of a permit; "take" not specifically defined; state law includes all federally listed species as state listed
Virginia	unlawful to "take" any endangered or threatened species of fish or wildlife; "take" defined same as federal ESA; no exemptions or permits to allow for incidental take
West Virginia	only lists federal T&E species as having protections; "Species of Concern" are listed, but have no legal status other than those that are already federally listed

APPENDIX E
APPENIDX E ECOREGION DESIGNATIONS WITHIN STATES AFFECTED BY APHIS-WS CONTINUED OR EXPANDED INVOLVEMENT INRABIES ORAL VACCINATION PROGRAMS

Ecoregions are ecosystems of regional extent as defined by Bailey (1995). An "X" means the state contains the ecosystem/ecoregion described in the key below. The reader is referred to Bailey (1995) for more detailed descriptions of each ecoregion and the climate, soils, vegetation, and animal life that occur there.

State	Ecoregion Designation Number (Bailey 1995) (See Key Below)											
	212	M212	221	222	M221	231	232	234	255	315	321	411
Maine	X	X	X									
New Hampshire		X	X									
Vermont	X	X										
Massachusetts		X	X									
Connecticut		X	X									
Rhode Island			X									
New York	X	X	X	X								
Pennsylvania	X		X		X							
Ohio			X	X								
Michigan	X			X								
Indiana				X								
New Jersey			X									
Maryland			X		X	X	X					
Delaware							X					
West Virginia			X		X							
Virginia					X	X	X					
Kentucky			X	X	X			X				
Tennessee			X	X	X	X		X				
North Carolina					X	X	X					
South Carolina					X	X	X					
Georgia					X	X	X					
Alabama						X	X					
Florida							X					X
Mississippi						X	X	X				
Louisiana						X	X	X				
Texas						X	X		X	X	X	

APPENDIX E

Key to Ecoregion Designations (adapted from descriptions by Bailey 1995):

Numbers in the 200 series are within the "Humid Temperate Domain":

212 Laurentian Mixed Forest Province – lower elevation areas (sea level to 2,400 ft.), flat to rolling hills in relief, moderately long and severe winters; native vegetation types are transitional between spruce-fir coniferous boreal forest and broadleaf deciduous forest zones and are characterized by mixed stands of coniferous (mainly pine) species and a few deciduous species (mainly yellow birch, sugar maple, and American beech); in some areas, other tree species include hemlock, red cedar.

M212 Adirondack-New England Mixed Forest-Coniferous Forest-Alpine Meadow Province – mountainous region with elevations between 500 and 4000 ft.; warm summers and sometimes cold winters; native vegetation types transitional between boreal spruce-fir coniferous forest to the north and deciduous forest to the south; valleys contain hardwood forest (sugar maple, yellow birch, beech, hemlock), lower mountain slopes with mixed forest of spruce, fir, maple, beech, and birch, and higher elevations with fir and spruce.

221 Eastern Broadleaf Forest (Oceanic) Province – diverse topography; elevations from 1000 to 3000 ft.; cold winters and warm summers; native vegetation characterized by temperate deciduous forest dominated by tall broadleaf trees that provide a dense, continuous canopy in summer and shed their leaves in winter; dominant deciduous species include American beech, yellow-poplar, basswoods, sugar maple, buckeye, red oak, white oak, hemlock; includes areas of pine-oak forest ("Pine Barrens").

222 Eastern Broadleaf Forest (Continental) Province - flat to rolling to moderate in relief; elevations from 80 to 1,650 ft.; hot summers; native vegetation dominated by broadleaf deciduous forest with oak and hickory tree species more abundant than in other provinces; gradually turns more to prairie towards the Midwest, forming a mosaic pattern with prairie.

M221 Central Appalachian Broadleaf Forest - Coniferous Forest - Meadow Province – low mountains at elevations ranging from 300 to 6,700 ft.; distinct summers and winters; native vegetation characterized by mixed oak-pine forest, dominated by the white and black oak groups at lower levels; northeastern hardwood forest at mid elevation levels, and spruce-fir forest and meadows on the highest peaks.

231 Southeastern Mixed Forest Province – comprised of the Piedmont and irregular Gulf Coastal Plains with elevations from 100 to 1000 feet and flat to gentle sloping relief; mild winters, hot humid summers; native vegetation comprised of broadleaf deciduous (oak, hickory, sweetgum, red maple, winged elm) and needleleaf evergreen trees (mostly loblolly pine, shortleaf pine, other southern yellow pine species).

232 Outer Coastal Plain Mixed Forest Province – flat and irregular Atlantic and Gulf Coastal Plains areas; flat to gentle sloping to gentle rolling in relief; temperatures relatively steady across seasons; native vegetation comprised of temperate rainforest characterized by evergreen oaks and members of the laurel and magnolia families, with coastal marshes and interior swamps dominated by gum and cypress tree species; most upland areas covered by subclimax pine forest.

234 Lower Mississippi Riverine Forest Province – flat to gently sloping broad floodplain and low terraces made up of alluvium and loess; from near sea level in the south, altitude increases gradually to about 660 feet in the north; land of oxbow lakes and swamps are significant in the extreme southern portion of the province; warm winters and hot summers; rain falls throughout the year, with a minimum in autumn; temperature and precipitation decrease heading north; native vegetation comprised of bottom-land deciduous forest, with ash, elm, cottonwood, sugarberry, sweetgum, water tupelo, oak, bald cypress, and vines significant along water courses.

255 Prairie Parkland (Subtropical) Province – gently rolling to flat plains, many of them part of the Gulf Coastal Plain; elevations range from sea level to 1,300 feet: streams and rivers are sluggish; numerous wetland areas along the coast; warm winters and hot summers; rain falls throughout the year, between 35 and 55 inches; hurricanes are frequent in autumn; vegetation consists of prairies and savannas with medium-to-tall grasses and few hardy tree species.

Numbers in the 300 series are within the "Dry Domain":

315 Southwest Plateau and Plains Dry Steppe and Shrub Province – generally flat to rolling plains and

plateaus with elevations ranging from sea level to 6,500 ft.; semiarid climate; long hot summers and short mild winters; native vegetation characterized by arid grasslands in which shrubs and low trees grow singly or in bunches; dominant grass species include blue grama, buffalo grass, with mesquite, oak, and juniper typically the dominant shrub and tree species.

321 Chihuahuan Desert Province – mostly desert with undulating plains with elevations near 4,000 ft.; long hot summers and short winters; native vegetation mostly dominated by thorny shrubs, in many places associated with short grass such as grama; shrubs and trees include mesquite, creosote bush, yucca, and occasional scattered juniper and pinyon.

Numbers in the 400 series are within the "Humid Tropical Domain":

411 Everglades Province – extensive low elevation (sea level to about 25 ft.) areas consisting primarily of large areas of swamps and marshes; hot summers and warm winters; native vegetation consists of tropical moist hardwood forest dominated by cypress trees and mangroves along the eastern and southern coasts; much open marsh characterized by grasses, reeds, sedges, and other aquatic herbaceous plants; some areas with dense stands of sawgrass and three-awn grasses.

APPENDIX F
AMERICAN INDIAN TRIBES LOCATED IN STATES THAT MAY BE AFFECTED BY APHIS-WS CONTINUED OR EXPANDED INVOLVEMENT IN ORV PROGRAMS

FEDERALLY RECOGNIZED TRIBES

Alabama-Coushatta Tribe (TX)

Aroostook Band of Micmacs (ME)

Bay Mills Indian Community (MI)

Catawba Indian Tribe (SC)

Cayuga Nation of Nations (NY)

Chitimacha Indian Tribe (LA)

Coushatta Indian Tribe (LA)

Eastern Band of Cherokee Indians (NC)

Grand Traverse Band of Ottawa and Chippewa Indians (MI)

Hannahville Indian Community (MI)

Houlton Band of Maliseet Indians (ME)

Huron Potawatomi, Inc (MI)

Jena Band of Choctaw Indians (LA)

Keweenaw Bay Indian Community (MI)

Kickapoo Traditional Tribe (TX)

Lac Vieux Desert Band of Lake Superior Chippewa (MI)

Little River Band of Ottawa Indians (MI)

Little Traverse Bay Bands of Odawa Indians (MI)

Mashantucket Pequot Tribal Nation (CT)

Match-e-be-nash-she-wish Band of Pottawatomi Indians (MI)

Miccosukee Indian Tribe (FL)

Mississippi Band of Choctaw Indians (MS)

Mohegan Indian Tribe (CT)

Narragansett Indian Tribe (RI)

Oneida Indian Nation (NY)

Ononcaga Indian Nation (NY)

Passamaquoddy Tribe (ME)

Penobscot Indian Nation (ME)

Poarch Band of Creek Indians (AL)

Pokagon Band of Potawatomi Indians (MI)

Saginaw Chippewa Indian Tribe (MI)

Sault Ste. Marie Tribe of Chippewa Indians (MI)

Seminole Tribe (FL)

Seneca Nation of Indians (NY)

Schaghticoke Tribal Nation (CT)

St. Regis Mohawk Tribe (NY)

Tonawanda Band of Seneca (NY)

Tunica – Biloxi Tribe (LA)

Tuscarora Nation (NY)

Wampanoag Tribe of Gay Head (Aquinnah) (MA)

Ysleta del Sur Pueblo (TX)

STATE RECOGNIZED TRIBES

Cherokees of SE Alabama

Cherokee Tribe of Northeast Alabama

Chickahominy Tribe (VA)

Coharie Intra-Tribal Council (NC)

Eastern Chickahominy (VA)

Echota Cherokee of Alabama

Gun Lake Village Band of Grand Lake Ottawa Indians (MI)

Haliwa-Saponi Tribe, Inc. (NC)

Hassanamisco Nipmuc (MA)

Langley Band of Chickamogee Cherokee Indians (AL)

Lumbee Tribal Council (NC)

Machis Lower Creek Indian (AL)

Mattiponi Indian Nation (VA)

Meherrin Indian Tribe (NC)

Monacan Indian Tribe (VA)

Nansemond Indian Tribal Association (VA)

Nanticoke Lenni-Lenape (NJ)

Oklevuaha Band of Yamassee Seminole (FL)

Pamunkey Nation (VA)

Paucatuck Eastern Pequot (CT)

Powhatan Renape Nation (NJ)

Ramapough Mountain Indians (NJ)

Schaghticoke Indian Tribe (CT)
Shinnecock Tribe (NY)

Star Clan of Muskogee Creeks of Pike County (AL)

United Houma Nation (LA)

United Rappahannock Tribe (VA)

United Remnant Band Shawnee Nation (OH)

Unkechaug Indian Nation of Poospatuck Indians (NY)

Upper Mataponi Tribe (VA)

Waccamaw-Siouan Development (NC)

APPENDIX G
USDA-AGRICULTURAL MARKETING SERVICE-NATIONAL ORGANICS PROGRAM RULE ON ORV BAIT DISTRIBUTION ON ORGANIC FARMS

USDA

United States Department of Agriculture

Agricultural Marketing Service

STOP 0268 – Room 4008-S
1400 Independence Avenue, SW.
Washington, D.C. 20250-0200

April 15, 2003

Ms. Wendy Servoss
Environmental Coordinator
USDA-APHIS-WS
6213-E Angus Drive
Raleigh, North Carolina 27617

Dear Ms. Servoss:

This is in response to your request that the National Organic Program (NOP) rule on whether the U.S. Department of Agriculture's (USDA), Animal and Plant Health Inspection Service, Wildlife Services (APHIS-WS) Oral Rabies Vaccination (ORV) Program will have an adverse affect on organic crop and livestock operations.

We understand the ORV Program to be an emergency disease treatment for the control of rabies. As such the program is addressed under NOP section 205.672, Emergency pest or disease treatment. We further understand that APHIS-WS will typically hand bait in highly populated urban areas and will typically aerially distribute the baits in other areas at the rate of approximately 75 baits per square kilometer.

We have determined that the placement of ORV bait blocks, consisting of a genetically engineered vaccine imbedded in fishmeal bound by a polymer binding agent, on an organic operation will not have an adverse impact on that organic operation. This determination is applicable to ground and aerial distribution of ORV baits. The basis of this determination is that the vaccine is not expected to contact organic crops or to be consumed by organic livestock.

In the unlikely event that a bait block breaks and exposes a plant(s) to the vaccine, the organic producer can remove the affected plant(s) with no adverse effect on the operation's certification. This would comply with section 205.672(a). The organic status of animals feeding on the ORV bait block and not penetrating the vaccine will not be adversely affected. In the unlikely event that an animal consumes the vaccine within the ORV bait block that animal will lose organic status as provided in NOP section 205.672(b).

After reviewing documents provided by APHIS-WS, we believe there is little chance that an organic animal will consume the vaccine within an ORV bait block regardless of whether the baits are hand or aerially distributed. To further reduce the chances of livestock consumption, baits

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distributed by hand should be placed outside of areas containing livestock. When baits are aerially distributed livestock producers can reduce the chances of livestock consumption by relocating any bait found within an area containing livestock to a point outside of that area.

Thank you for your interest in the NOP. If we can be of further assistance we can be reached at 202-720-3252.

Sincerely,

Richard H. Mathews
Program Manager
National Organic Program